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The Materials of

Dye Kettle Construction

Observations Relating to Those Important Factors Upon Which the Most Economical Selection of Dye Kettle Construction May Be Placed

By HENRY BARKER BURKE

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FROM times remote there has been an inherent realization that the materials entering into dye kettle construction had a decidedly important bearing upon the obtainable results, both in regard to purity of shades and the costs of operation. In our era with its great metallurgical advances, we can trace varied and wide applications of metals and their alloys to an improved dyehouse performance in overall costs, chiefly through our ability to repeatedly produce true shades, in various colors from pink to black, from the one kettle.

However, among textile executives, chemists, dyers, mill engineers and all mill men having a responsibility in the production, the quality of the product or the maintenance and life of the equipment and more especially those who must assume the responsibility of purchasing dyeing equipment, there exists a rather confused, definitely limited and wholly uncertain knowledge of the potential value of the various metals utilized in dyeing machine construction, and the limitations of these materials under varying conditions, which may extend all the way from lack of brilliancy of shade to the serious deterioration of a particular machine construction.

With wooden equipment (dye vats) the consideration of obtaining true shades is solved by maintaining separate kettles for each range of shade and planning the work so as to dye progressively from lightest to darkest shades within the color range for which the kettle is allotted, it being customary to clean the kettle before again dyeing this color range. It is likewise customary, in dyeing very light shades, to maintain special kettles which are held apart and alone for each particular light shade.

From point of investment cost, a kettle of good, clear, clean cypress can be purchased at not much over half the cost of the all-metal construction and in most cases will be good for at least ten years' continuous use. The maintenance costs will be quite moderate and will include largely pipe replacements, valves, etc., and on piece dyeing equipment the upkeep will, in addition, cover rolls, creels and pins which must be kept in first class condition, not merely from point of strength, but in freedom from any defects which would impair the quality of the fabric.

Obviously the cost of the individual unit in such constructions is moderate, but under present conditions with the great variety of light shades in small lots and the exaggerated discrimination of the buyer, who, when to his advantage unhesitatingly rejects any colored yarns or fabrics that lack brilliancy, color tone, etc., it becomes definitely apparent that unless the dyehouse can have a wood kettle for each shade, they operate at a costly disadvantage because the wood absorbs color from the dyeing of one lot, which will be drawn out of the wood during the dyeing of the next lot although the kettle has been boiled out and may in effect appear stainless. This will so influence the shade (even dark shades) as to detract from that softness, luster and clearness that distinguishes a true shade dyeing from one contaminated by unknown quantities of color residues from previous dyeings.

Hence, there has developed a very real interest in dyeing apparatus designed to prevent this color absorption and to yield true shade dyeings time upon time. Unfortunately, however, we have more than the highly important factor of color absorption to consider in our choice of a thoroughly practical kettle construction. We have to consider the suitability of the construction in terms of dyehouse abuse. There is no department in the mill where the equipment is subject to greater wear and tear. The very nature of the work exerts its own deteriorating influence and coupled with this is the lesser consideration for equipment exhibited by that class of labor open and available for dyehouse work.

Hence, a factor of equal if not greater importance than color absorption, from the point of the net over-all cost per pound of dyed material, is the durability of the equipment. It must stand up to the continued use of the

reagents employed and it must withstand the greater amount of wear and tear to which all dyehouse equipment is subjected. This not only relates to the inside of the kettle, which is frequently the only part considered, but also to the outside of the kettle, which is subjected to the spillage of hot acid and alkaline solutions which may more or less rapidly deteriorate the kettle, especially the lower portions of the kettle which come below the floor level and which generally is found to be neither exceptionally well drained or ventilated and almost always difficultly accessible to inspection.

It is well to bear in mind that there have been two very definite motives underlying the use of various metals (or other resistant materials) in their application to dyehouse equipment; first:— the desire on the part of the dyer to be freed from difficulties attendant to repeated production of true shades in apparatus that absorbed or influenced the final color tone and secondly:— the desire of the management to reduce overhead by concentration of space necessary for a given production and the lessening of maintenance costs through having a kettle construction not only durable, but capable of being utilized through simple washing down for the application of various shades.

Therefore, as previously detailed under title of "The Economical Production of True Shades,"* cast iron can be used with high success with alkaline solutions. Steel of boiler plate specifications, while often used in kiers, has not stood up particularly well to dyehouse work and all colors will to a greater or less degree be influenced by the use of either of these ferrous metals. They have been generally utilized in the application of sulfur and indanthrene colors, especially on raw cotton or for sulfur blacks on yarns and elsewhere, where sulfur and indanthrene colors are used in heavy shades.

Likewise copper, both in the sheet and in its alloys, such as brass and bronze, have in the past found a considerable application in dye kettle construction, but as a generalization, the use of this metal and its alloys has been restricted largely to parts, i.e., pipes, creels, ratchets, etc., but in some special instances kettles were lined with copper sheeting. This was more particularly true in the silk industry, but occasionally was found in yarn dye kettles of the worsted and woolen trade. Neither copper nor any of its alloys can be used in connection with sulfur colors due to the action of sodium sulfide which is necessarily present to dissolve the dyestuff. Many acid and chrome dyestuffs are greatly influenced by this metal and it was a common practice to minimize the effect of the metal by adding some buffer, as ammonium sulfocyanide.

With the introduction of Monel Metal, wider and more dependable applications were made as related to complete metal construction. The metal (Monel) is highly resistant to acid, and makes a very suitable construction for dye kettles and parts, but inasmuch as it has a high copper content, which runs around 28%, it has caused with some dyestuffs, a very definite alteration of shade, nor is its use with sulfur colors to be well recommended, although the writer knows one or two instances where sulfur colors have been satisfactorily applied in Monel equipment, but this is an exception and not the rule. (As a matter of record, the writer might further point to the fact that occasional batches of sulfur colors in browns and blacks have been colored in all aluminum equipment without any harmful results either to the equipment or the product, but it could hardly prove a suitable recommendation.)

Aluminum is another of the widely used dyehouse metals. Its inherent weakness is the ease with which it is attacked by alkaline or caustic substances and this precludes its general application to sulfur and vat colors. It has, however, proved highly effective in all acid, chrome and direct colors, yielding a clearness and brilliancy of tone barely possible of duplication by other constructions and is for such work a wholly reliable and durable dyehouse metal both for vat construction and for parts.

Each of these different metals or alloys, which at different times have been made use of and are still being made use of in the construction of dyeing equipments and it should be noted that each has a very definite limitation and each in turn is used, if used successfully, for a very specific purpose and this has caused those whose interest lay in the direction of improving their dyeing or those serving them, to experiment with various compositions notably resistant toward chemical reactions, such as glass, vitreous linings, rubber, composition linings, either pressed, cast or reinforced with metal backings, etc.; but it is likewise an established fact that whereas these materials may be essentially good in themselves chemically, from a practical point of view they have not proved, under continual dyehouse use, to withstand the hard and abusive treatment that dyehouse equipment must stand to be of practical value, for these products when broken, blistered, cracked or worn in any part are subject to very rapid deterioration as well as proving the cause of inferior work, and the replacement cost, loss of production and processing defects lead to excessively high manufacturing costs.

There can be no question, as previously stated, but that certain special applications have been made of these various materials with entire success and for many special applications the writer can wholly concur with the theoretical soundness of the suggested choice, but mills and mill men are very largely concerned with the practical rather than the theoretical possibilities of a product. It should be noted further that glass and vitreous linings, while they offer very large possibilities, are greatly modified in practical value by the fact that in the process of firing it is wholly impractical to glaze both sides of a metal object, because in the natural removal of the gases formed there are bound to develop pin holes and blisters and any one of these surface breaks or weaknesses in these types of linings is cause for immediate chemical

* This Journal, Vol. XXII, *12*, 351.

reaction and more or less deterioration of the product. In addition there is the definite limitation as to shape and size or at least a disproportionately high manufacturing cost to attain shapes and sizes with the simplicity and the effectiveness arrived at in all metal constructions.

Of the latest metallurgical developments applicable to dyehouse constructions, the ferrous-chrome-nickel alloys widely designated as stainless steels offer a very great potential value to the dyer and the mill. These products open up a vast line of possibilities for economies, both in production of true shades and in low maintenance costs and excepting some special applications, it may be generally stated that they can be fully depended upon to produce true shades quite the equal of laboratory dyeings when employed for the application of color to cotton, wool or silk. Likewise, they show no reaction with reagents (acids, salts, alkalies, caustic) in any strengths commonly used in practice. These alloys, however, are admittedly poor in resistance to chlorides and particularly hydrochloric acid. Nevertheless, the writer has employed an all-stainless steel construction for the application of chloride of lime bleach and soured the goods off in the kettle with hydrochloric acid, without any discouraging results being recorded either in regard to the quality of the work or harmful reactions to the metal.

With direct colors (cotton) the metal cleans readily and shades using as little as 1/100 of 1% of dyestuff showed no saddening effects as compared with laboratory dyed samples of the same color. For sulfur colors it is ideal, as the alloy has no copper content. It likewise cleaned readily with the various sulfur colors employed. In a like manner the vat colors, acid and chrome colors have all been tried in this equipment without any noticeable defects occurring either in the influence of the metal upon the dyestuffs employed or reaction on the metal by the dyestuffs and chemicals used. This is quite interesting because there is a very large mass of metal per pound of material. In these practical runs the exposed metal surface (subject to chemical action) was some 8,000 square inches and 35 grains to 60 grains of color on 40 to 50 pounds of material was not flat or dull but clear and brilliant as carefully controlled laboratory dyeings of the same shades, all of which confirms in a practical way the very dependable inertness of this alloy in terms of dyehouse procedure.

The cost of constructions using this metal (stainless steel) is notably higher than with other previously used dyehouse metals and this is due first to a relatively high price for the metal itself, but more to the cost of processing the same. It is a difficult metal to work. However, the strength and rigidity of the metal makes for very economical construction and kettles may be readily made in various shapes and sizes. By fabricating sheet metal with supporting angle irons, or by welding, the equipment is freed from excessive metal castings on the outside, which have a tendency to corrode and carry contamination either to the dye bath itself or to the dyed material through contact with it. The advances made in welding technique now makes it possible to obtain welds as equally resistant to all dyehouse chemicals as the parent metal itself.

Another point which may prove of interest to those contemplating metal equipment is that the radiation is no where near as high as we have been led to believe. In regular runs of full capacity on circulating machines using chrome colors the dyebath once raised to boiling point dropped only 4 degrees Fahrenheit with the steam turned off during a further three-quarters of an hour run. Piece kettles would drop below this but it would be due in greater part to the cooling of the cloth as it is repeatedly brought into the air rather than the fact of the particular material construction of the kettle itself.

Dependable as stainless steels are for dyehouse use in an all-metal construction when fabricated by those with a background of practical experience it should be recorded as a caution to those potential users who would seek to limit expenditures through the combination of wood and metal that it is an established fact that stainless steels in combination with wood do not stand up particularly well in any type of dyehouse constructions. Flanges, reenforcing rods, etc., resting on or embedded in wood are seriously corroded in an unduly short time. The best and most practical construction for this metal is all metal both inside and out. This makes for rugged construction, freedom from corrosion as mentioned and general cleanliness, all of which contribute to decidedly low maintenance costs.

In summary, while the most economical and appropriate selection of material for dye kettle constructions is to be determined to a degree by the specific class of work to which the kettle will be put, i.e., direct colors, developed colors, sulfur colors, vat colors, acid colors, chrome colors, etc., we have in the stainless steels (there are several variations, grades, or types with slightly different physical and chemical properties) a material which from all practical tests appears highly appropriate for dye kettle constructions, especially where the restriction of metal influence upon the class of dyestuffs which are to be used is held to be advantageous or desirable.

● GENERAL RELEASES

The General Dyestuff Corp. announces release of circulars on the following products. Copies of these circulars are available upon request.

Algosol Blue I B C—a new water soluble vat dyestuff said to produce bright shades of blue of very good fastness to washing, to chlorine and to light. It is stated that this product will be chiefly of interest for the production of shirting shades of blues on cotton piece goods and for the production of level shades of blue on rayon. *Algosol Blue I. B. C. Paste*— a circular for the print trade pointing out that this product produces clear blue shades of excellent fastness properties so far not obtainable with any other Algosol blue.

Notes on Sulfur Bleaching of Woolen Materials

By E. P. SANTCROSSE

DESPITE competition of hydrogen peroxide for bleaching woolen materials, the use of sulfur dioxide in the production of stoved white and cream persists in certain branches of the woolen industry. A majority of manufacturers of blankets, bearskin pile fabric, raised sealskin and plushette still adhere to the reputedly old-fashioned sulfur stoving process in preference to using other methods of bleaching. Three reasons may be advanced to account for this state of affairs, (1) the low cost of sulfur bleaching; (2) it has been found that the pristine luster of the wool fiber is better preserved; (3) the process is a fairly simple one to carry out and supervision by a works' chemist is hardly necessary.

Sulfur bleaching is practiced on woolen and worsted hanks and warps as well as on woven material. The bleach house used for these materials is very similar in outward appearance to one employed for piece goods, the chief difference between the two types consisting of the internal arrangements since these have to be provided with appliances to suit the kind of woolen material on hand. Woolen goods for sulfur bleaching should be in a damp condition when put into the bleach house, the presence of water being essential to the formation of an active bleaching principle,

sulfurous acid H_2SO_3

$$So_2 + H_2O = H_2SO_3$$

The sulfurous acid reduces the coloring matter which soils the wool fiber, colorless compounds being formed. In some instances, bleaching is due to the formation of a colorless compound through combination of sulfur dioxide with the coloring matter in the fiber.

It has been found by experience that well hydroextracted goods contain just the right amount of moisture to fully develop the bleaching properties inherent in sulfur dioxide. It is better to hydroextract the goods in a rotary machine rather than by passage through a squeezing apparatus since the latter is apt to leave wet patches here and there in the cloth and the bleaching effect is not fully developed at these places. Crowding of the material upon the racks is to be shunned as a causation of unlevel bleaching; there must be plenty of space for circulation of gas between folds of the cloth, or between individual hanks. When the material has been loaded upon the racks, a quantity of crushed roll sulfur is ignited in a cast iron vessel placed upon the floor of the bleach house; when it is seen that the sulfur is burning in a satisfactory manner, the stove is closed tightly, the goods being left therein for several hours, or even overnight, in some cases. The next day, the material is taken out of the bleach house and either rinsed in cold water and dried straight away, or else it is spread out in a field to dispel the sulfurous fumes, and washed in cold water later on. Treatment in a cold weak solution of peroxide of hydrogen made slightly alkaline with silicate of soda is effective in removing the sulfurous fumes from the goods. Material containing cotton is occasionally treated in a weak peroxide bath after bleaching with sulfur dioxide with a view of circumventing tendering of the cotton through the presence of residual acid in the fiber.

Let us now consider in greater detail different types of apparatus employed for bleaching woolen goods with sulfur fumes. Much of the bleaching plant used by woolen manufacturers is quite simple in type, yet satisfactory results are obtained. In Fig. I is depicted a

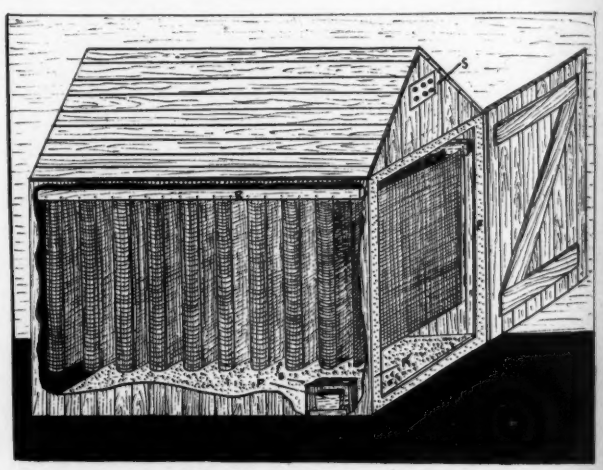

Fig. 1.

simple form of "brimstone" stove; the arrangement comprises a wooden bleach house some ten or twelve feet in length by six to twelve feet in width, the interior being furnished with one or more pairs of wooden rails, R, studded with aluminum tenter hooks to which are attached the selvedges of the fabric to be bleached. The iron vessel or "pot" which contains the sulfur is depicted at P; a metal baffle with perforated sides, B, is some-

times placed over the sulfur pot to guard against risk of fire. A number of holes, S, are bored through the side of the bleach house at a convenient point near to the apex of the roof, these holes being intended for the egress of moist air. The holes can be covered or uncovered by means of a wooden slider. Leakage of gas around the edges of the door is mitigated by covering the door lintels with a broad strip of felt, F; the felt is about three-eighths of an inch thick, the felt gauge being No. 10. We have seen bleach houses without this felt around the door lintels; in some instances, a strip of blanketing was made to serve instead of felt. Earthen floors may be used in bleach houses and, in the absence of heating arrangements in the structure, earthen floors are better than brick ones. Wood floors prove satisfactory. Concrete floors, like those of brick, are rather cold and their comparative coolness is apt to induce sublimation of free sulfur upon the fabric.

Three bleach houses of the lean-to type are depicted in Fig. 2; they are placed under a weatherproof canopy attached to the outer wall of a building. Double doors are provided at one end of each bleach house. The principal internal dimensions of each bleach house are as follows: Length, 10 ft.; width, 5 ft. 10 in.; height at the back, 9 ft. 4 in.; height at the front, 7 ft. 4 in.; height of doorway, 6 ft. 4 in.; width, 5 ft. 2 in. Ten inch diameter holes are bored near the top of each house for ventilation. The rack rails containing the tenter hooks are fixed 6 ft. 2 in. from the floor level. The hooks are 1¼ in. apart. The capacity of each bleach house is about 200 yards of cloth.

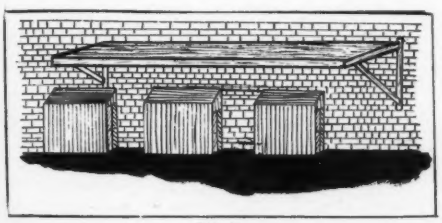

Fig. 2.

Two varieties of "brimstone pots" are shown in Fig. 3. The pot depicted at A is merely a rectangular cast-iron receptacle about 12 in. long, 8 in. wide and 5 in. deep, internal measurements. The pot depicted underneath this one consists of two portions, C and B, these being hinged together at D. When the charge of crushed sulfur has been placed in the lower part of the pot, it is ignited and the two halves are brought together again, the sulfur dioxide finding an outlet by way of the nozzle, N. The air pipe, E, is connected to a small power-driven rotary blower, this ensuring an adequate supply of oxygen to convert the sulfur into a properly balanced gaseous dioxide free from volatilized sulfur. This type of brimstone pot offers the advantage that there is usually no difficulty in keeping the sulfur burning at a steady rate; whereas, when a plain pot is in use, combustion may cease a short time after the stove has been closed up.

Fig. 3.

Moreover, where the improved type of pot is used, there will be no need to have it placed inside the bleach house for, by connecting the nozzle to a length of piping, the gas can be conveyed to any convenient point within the bleach house, while the pot remains outside where it can be tended.

A bleach house suitable for continuous processing of piece goods is depicted in cross-section in Fig 4. In this arrangement, the fabric is made to pass in the open width over a series of wooden rollers spaced at intervals within the structure. When the cloth leaves the machine by

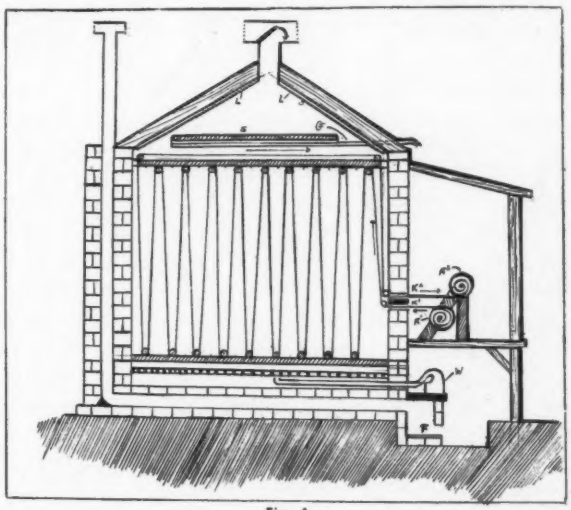

Fig. 4.

way of the slit, K2, it is batched up on a roller, R2. The other roller, R1, contains the cloth before it is run into the bleach house, entry being through the slit, K1. The fabric only travels at the rate of a few inches per minute through the apparatus. When a batch has passed through in one direction, a run in reverse direction is given if it is considered that the bleaching has not progressed to the extent required. In order to circumvent leakage of gas at the slits, K1 and K2, various contrivances are made use of. One device consists of a long, felt-lined slit with adjustable jaws just opened to an extent sufficient to permit passage of the piece without undue drag. Another arrangement comprises a number of rapidly rotating soft bristled brushes which press lightly on the cloth as it passes along. The brushes are affixed close up against the slits, K1 and K2, the direction of rotation being so arranged that particles of gas which find their way through the slits are forced back again, with more or less success.

The ceiling within the bleach house is encased in sheet lead, as indicated by L, L. To circumvent the condensation of moisture on the metal, a small battery of steam pipes is sometimes affixed in the upper part of the structure, as indicated at S; a leaden gutter, G, connected to a waste pipe is fitted underneath the steam coil to deal with

condensation water from the pipe joints when they are first warmed up at the commencement of the day's work. The sulfur dioxide gas is generated in a hooded pot, W, the nozzle on which is connected to a length of conveyance piping leading into the cavity below the false floor of the bleach house. A small rotary blower is made use of for supplying a current of air to the pot in order to maintain steady combustion of the sulfur. The air pipe ends in a number of upright nozzles around which the crushed sulfur is heaped. A supply of air adequate to ensure proper combustion of the sulfur is essential since lack of oxygen results in a portion of the sulfur vapor subliming on the fabric and also on the interior fittings of the bleach house, causing the development of unsightly yellow stains.

Where the bleach house is constructed of brick, it is customary to provide means for gently heating the masonry, more particularly during cold weather, since sulfur vapor readily sublimes when it comes into contact with a cold surface. Direct fire heating has been found efficacious in reducing the tendency to sublimation and reference to Fig. 4 will show that a furnace, F, has been depicted therein, together with a flue extending below the floor of the bleach house and up one side, also. In well-designed apparatus, three sides as well as the floor of the bleach house are enclosed with flues, these being arranged on similar lines as are employed when constructing a baker's oven. The furnace heat must be so regulated that the fabric does not become dry a short time after it has been entered into the bleach house. It is only necessary to take the chill off the brickwork in order to circumvent sublimation. If the flues are of ample area, there will be no necessity to use the steam coil for warming the leaden sheathing on the ceiling of the bleach house.

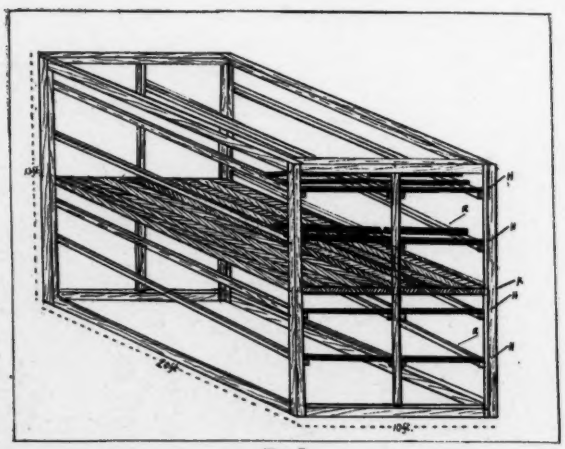

Fig. 5.

As regards the amount of roll sulfur employed for bleaching, it is customary to allow from 2 to 3 lbs. of roll brimstone per 60 yards of cloth to be processed. Thick, woolly fabric takes longer to bleach than thin material and it also absorbs more sulfur dioxide before the bleaching effect is perceptible. Hence, the consumption of roll sulfur is correspondingly higher than with thinner goods. Consideration will next be given to internal arrangements of bleach houses to be used for processing woolen hanks and warps. In Fig. 5 is depicted a four-tier wooden framework for use when bleaching hanks. The arrangement is housed in a timber or brick-built structure containing a number of glazed windows which can be opened when clearing the bleach house of sulfur fumes. The hanks to be processed are suspended upon wooden rods, H, the ends of which rest on the slotted rails, R. A portion of a rail is depicted in Fig. 6; the slots are two inches apart and are capacious enough to take the ends of the rods without any forcing being needed. A gangway, K, consisting of planks spaced a little distance apart is provided for the convenience of workmen when loading or unloading the yarn rods in the upper tiers. In some instances, the entire framework is mounted on flanged wheels for which a set of rails is provided leading into the open air. The frame may then be unloaded outside the bleach house with a minimum amount of inconvenience to the workmen through sulfur fumes adhering to the material.

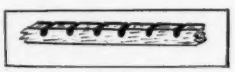

Fig. 6.

It is helpful towards a more even bleach in those portions of the yarn which rest upon the rods if these can be moved around a trifle during the bleaching operation. Two arrangements to this end are depicted over A and C, respectively, in Fig. 7, the device illustrated at A being considered the most efficient. For this, one end of each hank rod is fitted with a grooved wooden or aluminum wheel, the other end being provided with a leaden or aluminum-cased steel pin to serve as an arbor, as illustrated at B. The wheels are rotated simultaneously by means of a length of worsted cord, one end of this being attached to a counterpoise, W, while the other end is connected to a winding drum fitted with a ratchet and pawl to act as a stop to the pull of the counterpoise. The entire arrangement, with the exception of the winding drum, is placed within the bleach house. The type of shifting apparatus depicted over C in Fig. 7 permits of only limited movement of the yarn rods; in this arrangement, one end of every rod is fitted with a large wooden disc; these are loosely coupled together by means of a trace rod, K, which is moved in the required direction by pulling or pushing the hand lever attached to one end.

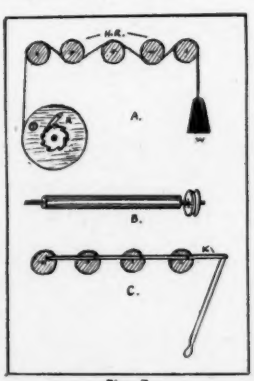

Fig. 7.

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PROCEEDINGS OF THE
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JULY 29, 1935

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Members should notify the **Secretary** immediately of all address changes

ANNUAL MEETING

The Annual Meeting will be held in Chattanooga, Tenn., on Friday and Saturday, December 6th and 7th, with headquarters at the Read House. Harold Schroeder, Chairman of the South Central Section announces appointment of the following committees with chairmen as indicated: *Railroad and Transportation*—John L. Dabbs, Jr., E. I. duPont deNemours & Co., Inc.; *Scenic Outings*—Harry H. Morrison, Permutit Co.; *Textile Ball*—A. Henry Gaede, Laurel Soap Manufacturing Co.; *Entertainment, Publicity and General Arrangements*—William J. Kelly, Jr., Burkart-Schier Chemical Co.; *Ladies*—Mrs. Harold Schroeder; *Reception*—Walter E. Hadley, Standard-Coosa-Thatcher Co.; *Registration*—Herbert A. Rodgers, National Aniline & Chemical Co.

Carl Z. Draves, who served as chairman of the technical program committee for the last Annual Meeting, has again been appointed to this position by President Robert E. Rose.

HAROLD SCHROEDER

CARL Z. DRAVES

Proceedings of the American Association of Textile Chemists and Colorists

Chemical Costs*

By R. E. RUPP†

WITH the present trend in the regulation of industry by the various governmental agencies, it is becoming increasingly important that the dye and chemical costs of the textile industry be watched with ever increasing vigilance. Whether you approve of codes or not and whether N.R.A. will soon cease to function or not, we cannot escape the fact that even before these existed we were surely moving toward legal limitation of the hours man and machines may work and are certain to continue moving in this direction as well as toward fixed and uniform hours and rates of pay. Furthermore, laws such as the anti-stretch out bill now pending are not beyond our vision and these will further fix the production allowed per machine and per operative.

Costs fall into three divisions: direct labor, fixed overhead charges and materials. With production and wages regulated by law the jurisdiction that an existing mill has over its direct labor and burden or overhead costs is very limited and the only phase over which it still has complete control is material costs. The mill management which neglects this item of its expenditures cannot other than find itself in serious trouble for there is no avenue open by which losses of this sort can be recovered.

Economy in materials immediately is resolved into two divisions: first, economical purchasing; and second, economical use of the materials after they have been bought. A greater loss by far may occur to a mill through misuse of materials than through bad purchasing. Under economical purchasing the laboratory has two functions, namely: comparing competing prototypes and then checking deliveries to see that quality is maintained. I do not in any way counsel neglecting this phase but to carefully check purchases and then to neglect careful scrutiny of the uses made of them is certainly penny wise but pound foolish.

Theoretically, of course, all dye and chemical houses are above suspicion, but it is just as well to check materials as they are received and keep them honest. Furthermore, although the amount may not be large, it never hurts a laboratory's standing to find a mistake and make possible the collection of a refund for as in other cases there is often more joy over one dollar returned to the fold than over the ninety-nine that never escaped.

It may be just a coincidence but I recall two plants. The first tested every shipment regularly for quality and strength and it was well known throughout the suppliers that this was the practice. The other began an intermittant check on supplies after not having done so for years. It was known also that the second plant did not check deliveries. In this plant, checking only about every fifth delivery, more off standard deliveries were discovered and credits allowed in six months than in the other plant in two years. The fact that the distributors of materials knew that one plant tested and the other did not might have accounted for this situation.

But important as checking may be, the dollars involved are small by comparison with the losses which may occur from excessive or improper use of this same material. If for example a product is being used at the rate of $1,000 per month, it is extremely unlikely that one-tenth of the shipments will be 10 per cent weak but granting that they are checking deliveries offers a possible reward of $120 per year. If a competing seller offers a two or even a five per cent better value the possible advantage is $600 per year. But suppose a change in process or equipment is made where a 50 per cent reduction can be made, or perhaps the entire product eliminated; then the goal is $6,000 or $12,000 per year instead of the $120 or $600 per year through correct purchasing. Such reductions are not impossible. They have been made and are being made today in finishing plants and none of us can afford to sit back and say that no such economies can be effected in our organizations without having made a careful study of the products used. It is so easy when troubles arise to add a little more of this, that or some new material and before long excesses are used and wholly unnecessary items are added to the chemical list.

There are in my mind three questions which must be asked and answered scientifically with respect to each material in a finishing plant in order to obtain maximum chemical economy. These are:

1. Is the material used in excess of actual requirements?
2. Is there not some other substance that could be used more advantageously?
3. And last, or perhaps better first: Can this material be dropped completely without spoiling the final result?

The principle that if one pound is good, two pounds are better is quite frequently very wrong. In fact, many times the result produced by two pounds of a material is definitely poorer than if only one had been used. In

*Presented at meeting, Piedmont Section, May 4, 1935.
†Chemist, Pacific Mills, Lyman, S. C.

such cases drastic reductions in material costs can be made with improved results. May I cite some specific examples. Repeated experimental work in laboratory equipment and actual plant tests have shown that if kier boiling is done with caustic soda, increasing the concentration of caustic soda used beyond a certain limit usually in the neighborhood of a one per cent solution, actually gives poorer results rather than better. If a curve is drawn plotting the effectiveness of the kier boil against the concentration of caustic used, we find that as the concentration increases, the quality of the boil-off also increases up to a certain level, then flattens out and with still further increases in the caustic concentration the slope is downward, which means that more caustic gives a poorer result. Here then it is necessary to study and determine the quality that the work demands and use the quantity of material to produce this quality, without excess. There have been many cases where amounts of caustic could have been reduced 50 per cent. The probable explanation of this particular case is that in kier boiling the process is partly emulsification, as well as saponification and hydrolysis by the caustic. Increasing the caustic at first increases the rate of saponification and hydrolysis but when sufficient caustic is present for these reactions, excesses simply interfere with the emulsification of the unsaponifiable substances which are present in the raw cotton.

While we are in the bleach house, acid may also be used in excess. A concentration somewhere between one-half and one per cent sulfuric acid will remove the mineral salts from cotton piece goods as completely as any higher concentration. Excessive amounts, while they do not in this case reduce the effect obtained on the fabric, are wasted, as well as causing undue corrosion of equipment. Again it is not impossible that the acid bill could be reduced 50 per cent in the bleach house.

Passing from bleaching to mercerizing many investigations have been published which show that a caustic soda solution 20 to 21 per cent NaOH gives the maximum shrinkage, luster, and dye affinity. In fact, Mercer in his original patent recommended the caustic to be between 40 and 50 degrees Tw., or between 18 and 22 per cent. It has been demonstrated repeatedly that higher concentrations give inferior results and extremely high concentrations produce but little mercerizing effect. There are today, nevertheless, mercerizers who still advocate high concentrations and where such is the practice, economies of considerable percentages can be effected without impairing the quality.

In finishing, while I have never seen any confirming work published, we have done some work which indicates that when softening is done with oils of any sort, there is for each oil a limit in the softness of a cotton fabric that can be obtained with that particular oil, and quantities greater than this amount do not produce greater softness, but instead undesirable effects. This is logical if we consider that softening of a fabric is entirely a matter of lubrication, lubrication both of the yarns in the fabric, and lubrication of the fibers within the yarns. When excessive amounts of oil are used they do not improve the lubrication any more than excessive amounts of oil on a bearing. In softening cotton fabrics if softness is plotted against the oil content of the fabric, usually at 1 to 1½ per cent oil the curve flattens and rises no higher or in other words oil beyond this point is wasted.

In the case of soap there have been many researches by widely different concerns and different individuals which show that quite low concentrations of soap give the maximum detergent action. These optimum concentrations vary with the kind of soap, the temperature at which used, the dirt to be emulsified, and other factors. Concentrations higher gives poorer results. Frequently an extra quantity of soap is added for an especially difficult soaping problem, when it is quite possible that the increased quantity actually lowers the effectiveness, as well as increases the cost. And so through all the processes there are many cases where by careful study of the problem and installation of more accurate control measures, chemical consumption may be reduced by as much as 50 per cent.

The possibilities of replacing one type of chemical with another are numerous but it is not always easy to decide when a change is economically desirable. In the case of soap, these newer detergents, about which we hear so much, raise the question—should they replace soap? It is, I believe, reasonably certain that some of the claims made for these products are exaggerated and whether they should replace soap or not probably depends on the class of work, the water supply, and other local conditions. It is one of those problems that each mill has to investigate and answer for itself.

In colors even more than chemicals, it is necessary that a continuous search for economies be made. In the dyeing of plain shades there are usually combinations of colors of the same class that can be used for a given shade and with the many classes of colors that are available, it is highly important that we know the exact requirements for a given shade if it is to be done in the most economical way. The most important problem is not should we buy this color from A or B but instead, should we use this color at all; is there not some cheaper and better combination that should be used and is the color being dyed so as to obtain the maximum value from it?

Complicated as is the situation with respect to plain shades, the complexity increases many fold when we come to printed designs. Here are different classes of colors which cannot all be used together and while a certain dye may be the ideal one in one combination, it may be very uneconomical for the same identical shade in another pattern because of the different character of the design. With the rapidly appearing new colors of different types,

(Continued on page 426)

Snapped at the
ANNUAL OUTING
New York Section

ANNUAL OUTING, NEW YORK SECTION

THE annual outing of the New York Section was held at the North Jersey Country Club in Paterson, New Jersey on Friday, June 28th. About 100 members and guests enjoyed the program which included tennis, golf and the annual banquet in the evening at which time the various awards were made. The results of the golf tournament were as follows: *Members*—Low Gross Award—to Edward McCabe, American Aniline Products, Inc.—86; Low Net Award (entitling the winner to retain possession of the cup for one year)—to J. O. Huizeng, Century Ribbon Co.,—65; Kickers Handicap awards (by draw)—1st, to G. L. Armour, American Aniline Products, Inc.; 2nd, to A. P. Howes, Howes Publishing Co. and 3rd to Ed Staab, National Aniline & Chemical Co. *Guests*—Low Gross award—to Dan Rion—77; Kickers Handicap awards (by draw)—1st, to A. R. Nazzaro, Synthetic Fibers Corp., and 2nd, to F. W. Green, National Aniline & Chemical Co. There was no regular tennis tournament held although several enjoyed the game.

For those who did not enter into the sports program, Arthur Wiehl acted as chief receptionist and promotionist of the general festivities. The appreciation of the Section is due Henry Herrmann who, as chairman of the Outing Committee, made the necessary arrangements which culminated in one of the most successful outings of this Section.

Respectfully submitted,

P. J. KENNEDY,
Secretary.

ONE HUNDRED AND SECOND COUNCIL MEETING

THE Council held its 102nd meeting in the Engineer's Club of Boston on Friday afternoon, June 14, 1935. Present were Vice Pres. William H. Cady, presiding; Wm. R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; Hugh Christison and Carl Z. Draves, Councilors at Large; and Harold C. Chapin, Secretary. The Secretary's report of the last meeting was approved as published. The Secretary's balance sheet of June 13, and the Treasurer's report of June 14, were accepted.

In response to a request from a local Section for an interpretation of Article III of the Constitution it was voted that in the opinion of the Council the sentence, "Active members only shall have the right to vote in the business of the Association and to hold office", was intended to apply to offices in local Sections as well as in the national organization. A complaint from another Section that the privilege of addressing meetings has been abused on certain occasions through excessive self advertising, was recognized in the resolution that; "The regulation of speech in any Section meeting is left to the discretion of that Section, and in any general meeting of the Association to the Program Committee for that meeting; but the Chairman of the Research Committee, in his capacity as Editor of the American Dyestuff Reporter, is authorized to reject for publication any paper, or any part of a paper, publication of which might be injurious to the best interests of the Association".

It was reported by the Chairman of the Research Committee that the program approved at the April Council meeting is being financed by the Textile Foundation as proposed. Salaries of Research Associates Glarum, Harris and Ryberg were fixed therefore, in accordance with recommendations of the Research Committee. Appreciation

SECRETARY'S BALANCE SHEET
*June 13, 1935

	Applications	Dues, Regular & Re-instate.	Dues, Sustaining & Contributions	Dues Corporate	Miscellaneous	Bank Charges	Totals Net
Received by Secretary, Nov. 1, 1934 to Apr. 11, 1935.....	$897.50	$5,692.25	$225.00	$1,675.00	$949.17	—2.23	$9,436.69
Received by Secretary, April 11, 1935 to June 13, 1935.....	240.00	305.00	20.00	250.00	170.18*	— .60	984.58
Total Receipts for Fiscal Year to June 13, 1935.....	1,137.50	5,997.25	245.00	1,925.00	1,119.35	—2.83	10,421.27
Transmitted to Treasurer.....	1,005.00	5,907.25	235.00	1,925.00	1.091.95	—2.73	10,161.47
Leaving to order of Secretary in Appleton Bank of Lowell	132.50	90.00	10.00	.....	27.40	— .10	259.80

*Miscellaneous Items

Year Book, receipts through Howes Publishing Co.	$103.24	Silk Standards	1.06
Year Book, sales and postage	10.65	Knitted Tubing	7.12
Dyestuff Reporters, sales and postage	10.00	Pins	4.50
Analytical Methods	33.61	Total	$170.18

was voted the Howes Publishing Co. for additional contributions bringing its total for the fiscal year to $500.

Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided that no objection be received before that date by the Secretary.

Active

Charles H. Albrecht, Lee L. Baker, R. O. Beadel, D. A. Bunce, R. B. Child, T. W. Church, William E. Copeland, Robert M. Covington, John J. Cumings, John T. Doole, Alban Eavenson, C. C. Ewan, Edwin Farnworth, Edgar Galli, Clayton A. George, George E. Gillespie, James N. Grant, E. H. Grayson, Ralph W. Holbrook, Roy Kritzer, Parker W. Longbottom, Felix B. McLain, Rocco Nazzaro, R. F. Patterson, James L. Phillips, James Pilkington, Frank U. Rapp, Richard J. Reynolds, George W. Riley, William J. Schaetzle, H. O. Shuptrine, Robert D. Sloan, Herbert G. Stone, Robert F. Strahley, Francis E. Stuart, Lawrence S. Thompson, Stanley Woodford, Erastus Young.

Junior

F. L. Gonnerman, R. J. Hassett, Carroll H. Henkel, J. T. Herbert, Jr., Henry C. Hoffman, Norman W. Kent, Gerald A. Robillard, Joel A. Weston, Richard W. Wilson.

Associate

Frederick G. Brown, E. H. Driver, J. A. Hird, Valdemar Jacobsen, Frank W. Johnson, John F. Nation, Sam H. Reynolds, Miles J. Smith, W. E. Wentworth.

Student

Winthrop E. Banks, John V. Heffernan, Gene M. Knight, Moushy Markarian, Joseph Shain, W. W. Webb, H. A. Wormwood, Charles L. Zimmerman.

C. C. Westbrooke and R. W. Delaney were transferred from Junior to Active membership.

Respectfully submitted,

H. C. CHAPIN, *Secretary.*

CHEMICAL COSTS

(Continued from page 423)

no printing department can operate efficiently without a continuous study of patterns and a continuous investigation of new products, as well as a complete knowledge and understanding of the classes of dyes in existence.

In connection with printing, it is of course well known that the thickener used may cause variations in the color value as great as 100 per cent. It does not take a very large print works to use a quarter of a million dollars worth of color per year and if only 10 per cent better color value is obtained by a change to a more efficient printing medium, it would easily pay for a large research program and a thorough plant investigation. This is as you know one of the major research programs our Association now has under way at Brown University, an involved problem to be sure, but one worthy of our best efforts.

And finally, the third question, the one that might well be asked first: Can this material be eliminated entirely without any substituting product? Of course it would be difficult to eliminate color in dyeing a navy blue but not all the cases are so ridiculous. Changing classes of work and changing or improving equipment often allow a chemical to be dropped entirely. I refer again to the bleach house for an example. The quite general introduction of automatic kier pilers and forced pump circulation systems, as well as having done away with the necessity of the double boil, have to a large extent eliminated the necessity for kier assistants, penetrating agents, and the like as well as reduced greatly the need for desizing compounds.

In the dye house and in the color shop, wetting agents, solvents, assistants, etc., while occasionally indispensible, have been emphasized by elaborate sales campaigns far beyond their importance and in many cases equally good or better results are obtained without them. In fact, all these so-called specialties should be well investigated before adoption and regular use for they offer one of the easiest ways of wasting money in the whole finishing business.

In the starch and tenter room it is not unusual to see a finishing formula containing eight or a dozen different materials. While I do not pose as an expert starcher, it does seem a fair question to ask whether a number of these could not be eliminated with equally good results and at a marked economy.

These are not problems that once solved stay settled, for constantly changing demands, improved equipment, and new colors and chemicals compel the efficient organization to ask continuously of a material: Is it used in excess? Is there a better substitute? Can it be eliminated entirely?

CALENDAR OF COMING EVENTS

Sectional Summer Meeting, Signal Mountain Hotel, Signal Mountain, Tenn., Aug. 2nd and 3rd.

* * *

Annual Meeting, Read House, Chattanooga, Tenn., December 6th and 7th.

Proceedings of the American Association of Textile Chemists and Colorists

Textile Calgon*

By E. B. BELL†

THE principal objective of this paper is to present Calgon to you as a textile assistant with far-reaching possibilities rather than as a water softener alone. It is a water softener of course. In fact, it is the best water softener known at the present time, for only with Calgon can you get sub-zero soft water. By "sub-zero" I mean water which actually consumes calcium so that you can add calcium to a solution containing Calgon and still have zero-soft water. Furthermore, there is no chemical way of detecting the presence of that added calcium except by evaporating the solution to dryness.

If we had to depend on its water softening properties alone the field of Calgon applications would be somewhat limited for there are many well-known water softeners which, even though they are less efficient than Calgon, do find some applications.

One of the best of these water softeners is common ordinary soap. Soap does a very thorough job of softening water but unfortunately soap-softened water is a potential source of much trouble in textile processes. Also in common use are such phosphates as mono-, di- and tri-sodium orthophosphate; ordinary phosphates‡, however, do not really soften water which contains soap because calcium soap is so much more insoluble than calcium phosphate that in the presence of soap, calcium phosphate will dissolve and the calcium will reprecipitate as lime soap. Actually it is not even necessary to use soap in order to have lime soap present since lime soaps are present in the wool on a sheep's back and may also be formed from the precipitation of the impurities in raw cotton by calcium and magnesium and present in the goods when received at the bleachery.

We all know that soft water is better than hard water for all textile processes. While it is impossible to obtain absolutely calcium-free water by any process other than distillation or electro-osmosis, the use of Calgon gives zero-soft water without removing any of the calcium from solution.

Calgonized water gives excellent results in kier-boiling Raw cotton contains as natural impurities pectic substances, the calcium salts of which are extremely insoluble in hot alkaline kier liquors. Although even the softest water has no effect on these salts, Calgon will change them to sodium compounds which are very soluble and easily removed from the fibers.

With the assistance of Calgon raw wool can be scoured cleaner than can be done with soap and alkali alone or with any other assistant. While it is desirable to get the stock as clean-looking and as lofty as possible, it is not necessary to remove all the oil or grease, as small amounts are beneficial and permissible. Scouring with Calgon can be adjusted to allow this small favorable residue to remain on the wool. This is especially important for commission scourers, since they might lose money if they scoured their wool to a lighter weight.

Trade regulations specify the amounts of moisture and oil or grease that wool, woolen or worsted goods may contain but no mention is made of permissible quantities of lime salts or soaps. Moisture and grease may be adulterants but they do no actual harm. Lime soaps, on the other hand, are very harmful. They give a harsh feel and poor color to stock, tops and yarn; they cause unevenness and gummy deposits in the dyeing process and they give the finished goods a poor feel, a dull color and often an objectionable odor.

In raw wool scouring, if Calgon alone is added to the No. 3 bowl of a four-bowl train, the lime soaps that are carried into this bowl on the stock will be converted into active sodium soap which will make a good suds and will continue the scouring. At the same time the wool gets a more thorough rinsing than could be accomplished by two bowls of ordinary water. In other words, by the use of Calgon, the equivalent of three bowls of scouring and two bowls of rinsing is obtained from a four-bowl train.

One of the most outstanding virtues of Calgon is its versatility in use, and raw wool scouring is one of the best examples of its ability to do a particular job in any way that is desired. With the assistance of Calgon wool can be scoured so that it will be whiter, loftier and better-smelling than can be accomplished by the usual treatments and yet an extraction will show as much oil and grease present as in regular lots of scoured stock. Of course, more oil and grease can be removed if it is so desired. Another of Calgon's valuable applications is its ability to scour mohair to a better color without making it wild. It has also proved itself to be of great help in removing

*Presented at meeting, R. I. Section, April 26, 1935.
†Textile Chemist, Calgon, Inc.
‡"Soft Hard Water," AMERICAN DYESTUFF REPORTER, June 4, 1934.

the odor from yellow off-sorts and similar stocks. Not only is the wool scoured more easily but it comes out loftier. This generally increases the capacity of the dryers so that many more pounds of wool can be put through the equipment per hour often with no increase in soap and alkali.

If Calgon is used in the backwashing of tops the same improvement in feel and ease of dyeing will be obtained as in raw wool scouring.

Generally speaking, if woolen goods are clean, a dyer can dye them level with only reasonable precautions. If ordinarily level-dyeing dyes give uneven results it is seldom the fault of the dyer. Neither can it be blamed on the finisher since the goods may be free from soluble soap and free grease. In other words the goods may be clean in the old sense of the word and still cause trouble which cannot ordinarily be corrected by the finisher or the dyer. On the contrary, if the trouble is due to such causes as mineral oil, pulled wool, lime soaps or hard water, it can usually be remedied easily by using Calgon in the washers in conjunction with the usual soap and alkali. Sometimes the difficulty can be overcome by boiling-off the goods with ammonia and Calgon before dyeing. Hot ammonia and Calgon will convert even aluminum soap to good sodium soap which is soluble and easily removed.

I do not believe that a cold scour will cleanse goods as well or give them the same finish or handle as will a warm scour. Nevertheless, because of the great saving of steam there is much to be said for cold scouring and many mills are using it quite satisfactorily on certain goods. Calgon works into this process very well and gives much improved results. The goods leave the washer much whiter and cleaner and contain less residual soap than when Calgon is not used.

Rayon goods often contain a low grade of mineral oil, in which lime soaps are soluble. The combination forms a gum against which soap and volatile solvents are relatively ineffective. When goods containing mineral oil are scoured with soap they often get gummy and sticky, forming a scum which collects on the sides of the kettle and causes a great deal of trouble. The presence of Calgon prevents the formation of this gum and also dissolves any of it which may have been formed previously. Here again Calgon has changed the lime soap to sodium soap and the resulting emulsion of sodium soap and mineral oil is easily removed.

Soap is probably the best medium for degumming silk but its tendency to form lime soaps causes difficulties. This was formerly quite serious but now since we can remove the deposits of lime soap, we remove the only reason for not using soap. We recommend using Calgon in a rinse bath following the soaping.

I can probably best explain the action of Calgon on soap by running a demonstration for you. I have here a flask full of tap water. I shall add to it a solution of Olate Flakes and a little phenolphthalein to show that the solution is alkaline. You can see that the solution is almost clear. Now I shall add a solution of calcium chloride which will throw down a heavy precipitate of calcium soap. This calcium soap sticks to the sides of the flask and is insoluble, water-proof and greasy. It entraps other dirt, forms rings around your bath tubs and coats over textile fibers and apparatus. It is easy to see how it causes goods to dye unevenly and makes them dull-looking, harsh, sticky and smelly.

Calgon is the only agent known which will dissolve calcium soap in an alkaline solution—see how easily this precipitate dissolves as I add a little Calgon. It is all dissolved now and the solution is perfectly clear, which it has not been since I added the soap. This explains why Calgon is so effective when it is used in a rinse following any soaping operation and why a soap bath cannot break down if Calgon is present and the solution is not acidified. It is easy enough to control the alkalinity with any of the common alkalies.

Since Calgon will convert any lime salt into a sodium salt, its use has a double advantage. Not only does it dissolve lime soap and thus prevent the difficulties due to its presence, but it also regenerates the original sodium soap, which can continue to work as a detergent, or which can easily be rinsed out if it is so desired.

The dispersing action of Calgon plays an important part in all scouring or cleansing operations and also in many dyeing processes. Oily tops, raw stock or piece goods that ordinarily would be sticky, smelly or uneven, or perhaps would crock badly if dyed without scouring, can often be dyed in the grease if Calgon is added to the dyebath. Calgon works well in acid and neutral, as well as in alkaline baths, so that it may be used in any type of dyeing operation. Some dyers boil off their goods before dyeing, with Calgon and ammonia or with Calgon alone.

Calgon has a solubilizing action on a great many substances and particularly on most dyestuffs, while its dispersing property assists in the dissolving of dyes. Because it helps to get dyestuffs into solution more rapidly and also to dissolve larger quantities of dyestuff in limited quantities of water, it is of great assistance in machine or package dyeing. It even makes many dyes suitable for machine dyeing which are not recommended for this use by their manufacturers.

This applies to many direct cotton colors and may be demonstrated by dissolving two portions of yellow dyestuff in two beakers of hot water one of which contains a very small quantity of Calgon. It also assists in getting sulfur colors rapidly into complete solution. Its dispersing, solubilizing and cleansing properties all work to eliminate bronzy blacks in direct, sulfur and union dyeing. Certain chrome colors, such as Picramic Acid Brown, will dye

more level and work better in machine dyeing if Calgon is present in the bath.

Calgon is now used quite extensively in the naphtol dyeing of package yarn, warps and piece goods. If small quantities of it are put into the naphtol or prepare bath there will be better yield, less scum formation and less crocking. If it is put into the coupling bath there will be no formation of the scum which was formerly expected in all naphtol dyeing. No other material seems to have the power of dispersing or dissolving this scum as does Calgon. There will be no scum to carry over and smudge the goods and the crocking will be greatly reduced.

Used in a union dyebath, especially with low-grade goods, Calgon will eliminate uneven, streaky and bronzy dyeing and crocking. It usually makes the cotton dye heavier and it increases the penetrating power of the dye liquor.

Calgon is used in the soaping or dyeing of rayon goods to get better penetration, more level shades and to correct the tendency of the goods to mark off.

A Celanese or cellulose acetate dyebath is really a dispersion of an insoluble dyestuff. The dispersing qualities of Calgon greatly improve this type of dyebath with the result that the dyeing action is more rapid and level, the dye penetrates better and a great saving in dyestuff is effected. Not only are the goods improved but considerable money is saved besides.

I have prepared another experiment which will illustrate the dispersing power of Calgon. This flask contains plain water. I shall add to it a little lamp black and shake it up. When I pour some of it onto this filter paper you will see that practically all of the lamp black is filtered out.

Now I shall add some soap solution to the flask and shake it again. The suds show that there is an excess of soap and therefore the water must be completely softened. I shall pour some of it onto the next filter paper and you can see that considerable lamp black comes through into the filtrate, indicating that soap itself is a good dispersing agent.

This time I shall add a few drops of a standard strength Calgon solution to the flask, in about the quantity that we recommend for use in most textile applications. I shall shake the flask again and pour some more of the liquid onto this third filter paper. You see that much more lamp black comes through. Since Calgon cannot have any solvent action on lamp black, this is probably a physical, rather than a chemical, action. I could repeat the same experiment using soluble oil or almost any wetting-out or penetrating agent in place of the soap.

This is only one of the many examples that leads us to make the claim that Calgon improves the particular function of most of the usual textile assistants. In other words, Calgon helps them to do what they are supposed to do. As a result Calgon is in no sense a competitor of such other materials as are used to assist in textile processing; rather it is an adjuvant to such materials.

This lamp black experiment may explain the action of Calgon in a Celanese dyebath. It also helps us to understand how Calgon assists in freeing cotton goods from certain impurities or dirt during the kier-boil. Moreover, it may explain somewhat why wool scoured with Calgon has a better color and odor, even though it does not necessarily contain less grease.

After all this discussion of the applications of Calgon some description of the actual product may not be amiss. Calgon is molecularly dehydrated sodium phosphate, consisting basically of sodium hexametaphosphate which has the formula $(NaPO_3)_6$. It is a fusion product cooled from the hot liquid state in large sheets which are subsequently broken up. It is not crystalline but is rather an amorphous, somewhat hygroscopic material. It is very soluble in water and may be handled easily without special apparatus. In solution it acts chemically to replace two calcium ions by four sodium ions, thereby converting any calcium salt into a sodium salt. This action is accomplished easily and quickly even in the case of calcium soap, calcium oxalate or calcium phosphate. The calcium is sequestered in the negative radical of a complex soluble molecule which is inert to all other reagents.

Its use is very inexpensive for it is used in such small quantities that its actual cost generally amounts to only a few hundredths of a cent per pound of goods. Only rarely does it add even this minute amount to the total cost since usually it makes possible savings in production, time and other chemicals, to say nothing of the improvement in quality of the finished product.

Since Calgon has so many applications it would be impossible for me to discuss every one in which you may be interested. I believe it would be best to give each of you a chance to ask questions about applications in which you have a particular interest.

DISCUSSION

Q. Can you tell us something about the amount of Calgon necessary to use with reference to the hardness of the water or the quantity of soap?

A. It takes about 1.6 ounces of dry Calgon or 5 fluid ounces of Calgon solution to soften completely 100 gallons of water which has a total hardness of 1 grain per gallon. However, the exact amount to use can be determined best by trial, since additional amounts must be allowed for calcium on the goods in most cases.

Q. If the amount of soap varies, would that have any influence on the amount of Calgon? If you use more soap, would you use less Calgon?

A. You can cut down somewhat on the amount of soap when you use Calgon. That is, you do not need as much soap in soft water as you would in hard water. Once the water is softened, further additions of Calgon would

have no effect on the amount of soap used. Slightly more Calgon is needed at the higher pH values to soften equivalent quantities of the same water.

Q. How does it work in an acid bath?

A. It works equally well in an acid, neutral or alkaline bath. As a matter of fact, its first textile use was in an acid dyebath.

Q. You spoke about it being beneficial in reducing the bronziness of sulfur blacks?

A. Yes, by making the dye more soluble and at the same time cleaning the goods, it removes two of the principal causes of bronziness.

Q. In dyeing piece goods, it is good practice to use those colors which will reduce the oxidation on the selvages. Would Calgon have any influence there?

A. None that I know of, but it would be interesting to try it.

Q. Could the Calgon be put into your stock solution of soap?

A. It has been done but it is not necessary, although some mills do use this method. Calgon does revert under certain conditions. In water solutions at room temperature it is stable for months but if the alkalinity, the temperature or the calcium concentration is increased, it reverts faster. A Calgon solution with a pH of 9.6 at the boil in the presence of calcium is one-third reverted after five hours. In kiers it probably reverts before the end of the kier boil. However, it has done its work before it reverts.

Q. Can it be incorporated in soap?

A. We do not recommend it. If you put it into dry chip soap and then stored it for some months, you might have a considerable loss due to its picking up moisture from the atmosphere. It would gradually revert in liquid soap due to the relatively high alkalinity.

Q. Would it revert more rapidly if soap were present?

A. Only if the alkalinity were higher. The stronger the soap, the higher the alkalinity, which accelerates its reversion.

Q. What is the corrosive effect of concentrated solutions?

A. It does not act like an acid which attacks metal directly to form a salt of the acid. Almost all metals have a known solubility in water even though it may be extremely small and when they reach this given limit further solution stops. In the case of rather concentrated solutions of Calgon the metal in solution is sequestered by the Calgon just as is calcium which disturbs the chemical balance of the solution and permits more metal to be dissolved. This is true even of metallic lead.

In reasonably dilute solutions it will not dissolve metals and for this reason it is often used for insuring the absolute cleanliness of surgical instruments. However, we would not recommend storing strong Calgon solutions even in Monel metal. Stainless steel is the only metal which we know so far to be completely inert.

Q. You would use wooden containers for it?

A. You can use wood, porcelain, rubber, glass or stainless steel. One of our best customers made it up in an iron tank and has continued to do it for over two years. There is no apparent damage to the tank, but of course the iron picked up by the Calgon is harmful in many textile operations.

Q. Has a mixture of soap and Calgon any advantage over such products as Igepon or Gardinol?

A. Calgon should not be compared to these products. Gardinol and Igepon are substitutes for soap; Calgon is not. They are organic compounds; Calgon is inorganic. They make a suds; Calgon will not suds alone. It is a mistake to compare Calgon with these other types of products as they are entirely different. We advocate using Calgon with soap for scouring when a strong detergent is needed. Calgon, however, works equally well with these other products.

Q. What is the difference between Hagan Phosphate and Calgon?

A. Hagan Phosphate is unsuitable for textile processes since it is less highly purified than Calgon. You would be very likely to get into trouble by using Hagan Phosphate in textile processes on account of its greater iron content.

Q. How about using Hagan Phosphate in a dyebath?

A. I should not want to use it in a dyebath. Because of its iron content you might get dull shades.

Q. In dyeing, would Calgon help to protect the dyestuff from iron from the kettle?

A. Many dyers with iron dye kettles are using Calgon to overcome the effect of iron on the dyestuff but this must be worked out to suit the individual case. Calgon usually improves matters but in the laboratory we have found some cases which are made worse.

Q. Would Hagan Phosphate be more effective in that respect?

A. I think it would be less effective, as the capacity of the metaphosphate for repression of iron has been partially used in the Hagan Phosphate. Textile Calgon is made free from iron to produce brighter shades. The other product is manufactured for the elimination of boiler scale.

Q. Are both products hexametaphosphates?

A. Yes, basically.

Q. Is Calgon of any help in print pastes?

A. It has been incorporated in print pastes, in some cases quite successfully.

Q. In printing a salt red and a salt navy you get much better penetration with the red. The difference in penetration must be due to the greater insolubility of the agent. Would Calgon have any effect here?

A. The same principle applies here as in the lamp black experiment. Calgon tends to disperse it. Calgon will not take the place of Nekal, for, as I said before, it does not replace anything.

Q. How would you make up your stock solution in a plant?

A. It would be according to the amount you use. Calgon comes in 50-pound cartons, each carton containing two 25-pound bags. You can dissolve one bag in 10 gallons of water, or you can take a full-sized barrel and dissolve four bags in 40 gallons. It dissolves to form a heavy syrup at the bottom of the dissolving vessel, and this is then stirred up. The unadjusted type dissolves in about 30 minutes. It is harmless and easy to handle. You can put your hands into a concentrated solution without fear.

Q. What reaction does it have with starch?

A. A slight solubilizing action.

Q. Has it any use in taking starch out of the cloth after weaving?

A. We use it in sizing and somewhat in desizing.

Q. Explain the difference between Calgon and other products on the market which are supposed to have a similar action, Cammirin for instance.

A. They are not the same chemical and have neither the same properties nor even a similar action.

Q. Is there any difference between Calgon and Calex?

A. Calex is an instantly soluble form of Calgon. Once the products are in solution, they are the same.

Q. Would Calgon be of any value at the low temperatures of vat dyeing?

A. Yes, Calgon works very well at low temperatures, as well as at the boil.

Q. It would have the same advantage?

A. Yes, but, of course, as with most chemical reactions, its action is slightly slower at low temperatures.

ANNUAL OUTING, MID-WEST SECTION

THE annual outing of the Mid-West Section was held at Rochelle, Illinois, on June 15th, there being 91 members and guests present. Luncheon was served at the Rochelle Country Club and dinner was held at the Collier Hotel. The arrangements were again in charge of Ed Morgan and he and his committee deserve great praise for their contribution to the success of the outing.

The ball game was a feature of the morning, with salesmen completely outclassing the dyers by a score of 13 to 12, dyeing technique being of no avail in the pinches.

In the golf tournament held in the afternoon, 29 prizes were awarded, principal prize winners being as follows:

First Low Net Class A—Al Rathke—B. Z. B. Knitting Co.

First Low Net Class B—S. A. Berry—Olson Rug Co.

First Low Net Class C—Eric Hempel—Bradley Knitting Co.

First Low Gross Class A—Elmer Smith—American Aniline Products, Inc.

First Low Gross Class B—Joe Lange—Geigy Company.

First Low Gross Class C—Louis Blank—Morgan Dyeing & Bleaching Co.

Low Net Guest Prize—Harold Calvert—Hanover Woolen Co.

Low Gross Guest Prize—Earl Breyman—Caron Spinning Co.

It was the consensus of opinion that everything, including the weather, contributed to make this one of the very best outings the Section has had.

Respectfully submitted, E. A. JOHNSON, *Secretary.*

ANNUAL OUTING, PIEDMONT SECTION

OVER three hundred ladies and gentlemen attended the Summer Outing at Blowing Rock on Saturday, June 29th. The festivities consisted of a golf tournament for the men lasting all day, with play on the beautiful 18-hole Green Park Championship course.

The following were the prize winners:

1st Low Gross	G. S. McCarty,	74
2nd Low Gross	Paul F. Haddock,	80
1st Low Net	J. W. Ivey,	67
2nd Low Net	C. W. Gilchrist,	67
Lowest Number of Putts	Jim Sandridge,	28
High Score Booby Prize	John C. Robertson,	122
Guest Prize, Low Gross	Jack Garrett,	71
Guest Prize, Low Net	H. L. Derby,	66

The Golf Committee consisted of Fred Tilson and J. W. Ivey.

A bridge tournament was held in the afternoon for the ladies with the following committee in charge: Mrs. Joe Moore, Chairman, Mrs. Arthur Thompson, Mrs. Tom Church, and Mrs. Tom Smith.

The prize winners were:

1st High Score	Mrs. E. W. Klumph
2nd High Score	Mrs. W. H. Bertolet, Jr.
3rd High Score	Mrs. B. H. Alexander
Consolation	Mrs. H. Grady Miller

The banquet was held at 8 P. M. and everyone was enjoyably entertained by Mawrey Pierson, famous soloist of Spartanburg, S. C. The only address of the evening was by H. L. Derby, President of the American Cyanamid & Chemical Corp., whose subject was "The Chemical Industry."

The various prizes were awarded at the banquet and draw prizes were won by Mrs. Chas. H. Stone, and L. M. Boyd.

After the banquet a dance was held until the "wee small" hours.

Respectfully submitted, T. R. SMITH, *Secretary.*

APRIL MEETING, NEW YORK SECTION

THE April meeting of the New York Section was held at the Alexander Hamilton Hotel in Paterson, N. J. on Friday evening, April 26th. After the routine business of the section had been transacted, Dr. Karl T. Steik, director of research for the National Oil Products Company presented a paper on the use of white oils in the textile field. The paper was well received by those present as was evidenced by the intense interest in the lengthy discussion which followed.

Respectfully submitted,

PATRICK J. KENNEDY,

Secretary.

MAY MEETING, NEW YORK SECTION

THE May meeting of the New York Section was held at the Chemists' Club, New York City, on Friday evening, May 24th.

The officers of the section were all re-elected: Ephraim Freedman, chairman; George L. Baxter, vice chairman; Patrick J. Kennedy, secretary and John J. Sokolinski, treasurer. Mr. Freedman expressed his appreciation of the efforts of the other officers who have served with him, to Henry Herrmann for his untiring efforts in regard to the Annual Meeting of the parent body and to Louis S. Zisman who, as chairman of the program committee for the past season, so ably filled his office. Members of the sectional committee were elected as follows: Robert Gaede, Jr., H. D. W. Smith, Arthur Wiehl and H. Meyer. Dr. Meyer was also elected as representative to the Council.

H. D. W. Smith presented a paper on the activities of the U. S. Institute for Textile Research which was thoroughly enjoyed by all present.

Respectfully submitted,

PATRICK J. KENNEDY,

Secretary.

STANDARD SILK SAMPLES

There have been prepared, under the direction of the Sub-Committee on Fastness to Dyed Silk, standard dyed silk fabrics to represent four classes of fastness to washing—namely, Class I, Class II, Class III and Class IV. These standards have been carefully dyed with the dyestuffs and according to the dyeing methods recommended in the 1931 Year Book.

The A.A.T.C.C. is prepared to furnish sets of these washing standards for a nominal charge which will cover the cost of preparation. It will be possible to accurately grade the fastness by comparing it with the standards after subjection to the standard washing tests approved by this Association. All inquiries concerning these Silk Washing Standards may be addressed to the Chairman of the Research Committee—Louis A. Olney, Lowell Textile Institute, Lowell, Massachusetts.

AMERICAN
DYESTUFF
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ON GETTING ALONG WITH PEOPLE—III

(Continued from last issue)

Meeting Objections to a New Project

HAVING presented a new project for approval (see II of this series) you are almost certain to encounter some sort of objections to it. While each case has to be met individually, and the outcome may be largely a matter of personal ingenuity, there are general rules which are often helpful. It is assumed, of course, that you know what you are talking about and have a perfectly good project.

If objections are raised you will soon learn that there are different kinds of objections. You can probably recognize "honest to goodness" objections that are based on a definite belief that a thing will not work. Whether or not they appear to have any real foundation they should be given careful consideration, particularly on account of the subtle factors in textile processing which sometimes defy definition but are nevertheless very real, although you may never before have heard of them. An honest objector may be entirely correct. Even if not, if he is fair with you, his opinions should be respected and he must be made to see your point of view.

In contrast to the honest objector is the one who just does not want to have anyone else have anything to do with his affairs. He can raise the choicest line of objections that you ever heard, and if you talk to him on different days the arguments advanced today may be just the contrary of those offered yesterday. A prize example concerned an oil. On one day it would not stand up, which meant that it went through the machine too quickly and failed to serve its purpose. On the next day it wouldn't feed properly, which meant that it *wouldn't go* through the machine. These were both just arguments, and not reasons, for not experimenting with that particular oil. Unfortunately, mixed in with the more obvious "stalls" and unsound reasoning there are likely to be a very few plausible arguments to which you may not have the answers, or which can only be broken down by some one higher up in the mill.

There is no recognized course of procedure. You simply have to keep at it and try to make your case obviously enough better to put it across. Drop it for the time being if it seems best but leave the way open to bring it up once in a while. It is better to put it over alone if possible. However, if you are under orders and have to make a report, or the matter is important enough to justify it, it may be necessary to enlist the aid of somebody higher in authority. If this has to be done it will probably be best to keep that face under cover and to make any "interference" appear to be spontaneous and independent.

As usual there are exceptions. It may be necessary to take a very firm and definite stand and insist on cooperation, not merely nominal but real.

Some people take an unholy joy in finding fault and picking flaws in other peoples' suggestions while overlooking far worse ones in their own. How often have I had them strain at my gnats and at the same time swallow their own camels!

There are recognized principles for answering objections. First, be a good listener, particularly if the other fellow has a grievance. Let him get it off his chest even if it has but little connection with your affairs. Then you may get a chance to talk business.

Perhaps you can employ the "yes" technic. Ask a few questions whose obvious answer is yes and after it has been said a few times it may be easier to get a favorable reaction to your project.

You can frequently agree to small objections, but turn them off as inapplicable or unimportant. The mere agreeing helps. Always concede as much as possible and compromise where you can. You cannot, of course, compromise facts although you may find it wise to compromise in the treatment of them. Things may be put across by argument but no fact can be established by it. A fact stands upon its own legs of evidence.

Swift it was, who made the wise observation "It is useless to attempt to reason a man out of a thing he was never reasoned into." It has been said about politics and economics, and is just as true about our business affairs, that we say we reason about these things when actually a large part of this so-called reasoning and our (supposed) conclusions from it are merely the result of the circumstances in which we may have been, and are habit patterns rather than thought patterns. They immediately pop up to oppose changes and you will find that you yourself respond to many things in just the same way. Perhaps a little self analysis will help you to "don't be like that" and to see how to handle other people.

I once read a popular article on feeling and thinking. One seems frequently to be confused for the other, and feeling takes the place of thinking. That is one difficulty in dealing with people. They feel this way or that way and mistake it for thinking. If you want to work out

things from the facts of nature and laws of science it is a matter for thought. Your feelings have little to do with studying cases and drawing conclusions. If you have evidence you *think* that something is true. If you have little or no evidence you may merely feel that way.

Unless your "opponent" is another technical man or scientist, and sometimes if he is, he is likely to have come to many of his ideas without much thinking or reasoning. It will be better not to bother to try to reason him *out of* ideas that he already has, but to try to reason him *into* new ones. (*More comment will appear in subsequent issues*).

● NEW PATENTS

(*Abstracted by S. O. C. M. A.*)

Azo Dyes. (A dyestuff containing an azo dye substantially free from salt, trisodium phosphate, and triethanolamine, and being in the form of hard, shiny flakes.) William Stansfield Calcott, Pennsgrove, Francis Hervey Smith, Woodstown, and George Barnhart, Woodbury, N. J., assignors to E. I. duPont deNemours & Co., Wilmington, Del., No. 1,992,185, Feb. 26, 1935.

Water Insoluble Azodyestuffs. (Obtainable by diazotizing 4.6-dihalogen-3-anisidine and coupling in substance or on a substratum, especially the vegetable fiber, with the anilide or a p-alkoxyanilide of 2-hydroxy-naphthalene-3-carboxylic acid, yielding red shades of good fastness to light, chlorine and boiling.) Max Baltes and Kurt Briesewitz, Leverkusen-I. G.-Werk, and Arthur Zitscher, Offenbach-on-the-Main, Ger., assignors to General Aniline Wks., Inc., N. Y., N. Y., No. 1,992,461, Feb. 26, 1935.

(*Green*) *Water-Insoluble Azo-Dyestuff.* (Obtainable by combining a mono-diazonium salt of an anthraquinone compound with an acetoacetic acid arylide, an arylamide of a carboxyphenyl-methyl-pyrazolone, or with a urea obtained from a pyrazolone.) Werner Kirst and Max Kerth, Frankfort-on-the-Main, Ger., assignors to General Aniline Wks., Inc., N. Y., N. Y., No. 1,992,917, Feb. 26, 1935.

Manufacture of New Green Sulfur Dyestuffs. (Of particularly good fastness to soap boiling; more specifically, comprises the step of reacting a solution of N-alpha-naphthylanthranilic acid and 2-6-dichloro-4-amino-phenol hydrochloride with caustic alkali and an alkali hypochlorite, separating the resulting leucoindophenol and sulfurizing.) Ernest Chapman, Worsley, Manchester, and William Bertram Waddington, Higher Crumpsall, Manchester, Eng., assignors to Imperial Chemical Industries, Ltd., No. 1,993,087, March 5, 1935.

Solid Salts of Higher Molecular Alkyl Sulfuric Acids. (A product suitable for finishing textiles consisting essentially of the ammonium salt of stearyl sulfuric acid ester.) Heinrich Bertsch, Chemnitz, Ger., assignor to the firm H. Th. Bohme Aktiengesellschaft, Chemnitz, Ger., No. 1,993,431, March 5, 1935.

Chromiferous Azo-Dyestuff and Process of Making Same. (From different diazotized ortho-hydroxyaminonaphthalene sulfonic acids, by coupling with different naphthols and various chromium salts; dye animal fibers blue to black tints of good fastness properties.) Fritz Straub, Basel, and Hermann Schneider, Riehen, near Basel, Switzerland, assignors to Society of Chemical Industry in Basle, Basel, Switzerland, No. 1,993,462, March 5, 1935.

Indanthrone Printing Color. (Of blue shades of good fastness to bleach, obtained from 3,3'-dichloro-N-dihydro-1,2,2',1'-anthraquinoneazine treated with a sulfonating agent in the presence of a dehydrating agent under certain conditions.) Robert J. Goodrich, So. Milwaukee, and Joseph Dienet, Milwaukee, Wis., assignors to E. I. duPont deNemours & Co., Wilmington, Del., No. 1,993,660, March 5, 1935.

Production of Vat Dyestuffs of the Benzanthrone Series. (For example, comprises treating tribromo-(2-benzanthronyl)-1-aminoanthraquinone with acid condensing agents; dye cotton yellow-green to blue-gray shades.) Heinrich Neresheimer, Ludwigshafen-on-the-Rhine, Ger., assignor to General Aniline Wks., Inc., N. Y., N. Y., No. 1,994,025, March 12, 1935.

Vat Dyestuff of the Anthraquinone Acridone Series. (Strong gray to corinth shades of good fastness; for example, comprises heating trichloroanthraquinone acridone, obtainable in accordance with the German Patent No. 258,561, example 4, with 1-benzoylamino-5-aminoanthraquinone and sodium acetate with the addition of cupric chloride.) Robert Berliner, Leverkusen, near Cologne-on-the-Rhine, Ger., assignor to General Aniline Wks., Inc., N. Y., N. Y., No. 1,994,033, March 12, 1935.

Metalliferous Dyestuffs and Process of Making Same. (Comprises treating non-sulfonated dyestuffs, containing groups capable of forming lakes, with agents yielding metal, in an alkaline medium and in the presence of aliphatic hydroxy-carboxylic acids; dye varnishes and plastic masses yellow to brown to red to violet to blue to green to black shades.) Fritz Straub and Hans Mayer, Basel, Switzerland, assignors to "Society of Chemical Industry in Basle", Basel, Switzerland, No. 1,994,116, March 12, 1935.

● SAILS FOR EUROPE

Edward T. Bischoff, president of Ernst Bischoff Company, Inc., manufacturers of chemical supplies for textile mills, has left for an extended trip through Germany and Switzerland. He will make a survey of new products for processing textiles, which he may introduce in this country in the fall.

● INCREASED QUARTERS

American Aniline Products, Inc. have removed their Southern offices to 219 South Mint St., Charlotte, N. C. It is stated that a new and larger laboratory and increased warehouse facilities have been installed at the new quarters and that much larger stocks will now be carried to facilitate prompt delivery to Southern points.

Dyes
and the Toymaker

By Siegfried I. Obermann

DYESTUFFS have always been an indispensible adjunct to the toymaker since gaily colored toys always attract the juvenile eye. Not all the raw material used by the toymaking concerns is purchased in the ready colored condition for in many instances coloring of the toy can only be carried out when the article has been assembled.

Mohair, worsted and cotton plush for making Teddy Bears and other toy animals is never colored by the toymaker, such goods being dyed by the pile fabric manufacturer. The only coloring of plush animals done by the toy-maker is the tipping of the forefeet or paws of the Teddy Bear, etc., with brown or black dye. The dyestuff is dissolved in industrial alcohol, the solution either being sprayed or brushed on the toy. The brown dye is usually a mixture of Bismark Brown with a little Malachite Green for neutralizing the reddish cast of the former dyestuff. The black dye is commonly spirit soluble Nigrosine.

Bone material, usually in the form of counters for parlor games like Tiddley Winks and Ludo, etc., is colored by the toy-maker in various bright hues. The bone counters are always dyed after cutting to shape and smoothing of the sawn surface and the punched edges. These counters usually consist of thin discs of various sizes. They are generally dyed in bags of coarse netting, the bag being slung in the dye-vessel. The brighter acid and basic dyes are used for coloring the counters, the assistant used in the bath being acetic acid. Processing is done at the boil for 15-30 minutes, and at the end of this period, penetration is usually deep enough for material for use in the cheaper toy games. The following dyes are suitable for coloring bone counters: *Basic colors*—Rhodamine, Methyl Violets, Methylene Blue, Malachite Green, Magenta. *Acid and Chrome colors*—Patent Blue A and V, Fast Acid Violet A2R types, Indian Yellow, Acid Scarlet, Soluble Blue, Naphtol Blue Black, Afterchrome Black. Logwood Black is also used.

For logwood black, the counters are given 15 minutes boil in a fairly strong solution of logwood extract, after which they are plunged into a boiling bath charged with about 5 per cent of sulfate of iron. After a few minutes boil in this, the counters turn rich black. They are then taken out of the dyebath and rinsed in cold water.

Dolls' hair is frequently dyed by the toy manufacturer. In the majority of instances, cross-bred wool of extra long staple forms the raw material for the dolls' hair. The grey wool is dyed in 5 to 10 pound lots in a gas-heated vessel similar to the domestic clothes wash-boiler. Processing is generally done with cheap acid colors of the best leveling kinds like Indigo Extract, Naphtol Yellow, Acid Red 2GL and Orange II. Levelness of color is rather an important point to achieve in dyeing dolls' hair and ill-chosen dyes result in the color of the wool fiber differing considerably in tone at the root and tip. Dark brown, light brown and yellow brown are the hues mostly wanted for dolls' hair. Shades of auburn and "carrot" red are only occasionally called for. Colored dolls of the African and other native types are now being made. These dolls require black "hair" of a more woolly kind than dolls modelled in the Aryan style. Sulfoncyanine Black is used for processing this class of dolls' hair because the color is easily absorbed without the necessity of a prolonged boil of the stock, thus keeping felting of the fiber at the minimum. The wool is invariably purchased in the ready scoured condition by the toy maker.

A certain percentage of white and colored cotton wadding is used in toy making. The white variety is usually employed for decorating Christmas toys in imitation of a covering of snow. Colored cotton is often used for the "hair" of cheap dolls, etc. In some instances, the toy maker dyes this cotton himself with cheap bright substantive colors like Chrysophenine, Benzopurperine 4B and Direct Sky Blue FF.

Horsehair is used quite frequently and colored horsehair is employed, for example, for the eyelashes of dolls' eyes. It is occasionally necessary to dye this horse-hair to match the dolls' hair in cases where naturally colored horsehair in the appropriate hue is not available. Similarly, hair for the maines and tails of toy horses is frequently dyed by the toy maker. In some instances, the object of dyeing the hair is purely to enliven the existing natural color, since the enhanced gaudiness of this usually makes the wooden type of brightly painted toy horse appear more attractive to the juvenile equestrian! As might be expected, acid dyes at the boil are used in such cases.

Cork has sometimes to be colored by the toy maker. This substance does not take dyes at all well and basic colors prove most suitable for this material. Since the natural color of cork is brownish, the substance must undergo a partial bleach before it can be processed in bright hues like pink, green and blue with basic dyes. To bleach the cork, the articles made from it are put in a coarse bag along with a few chunks of clean stone in order to prevent the bag from floating on the liquor. The stock is then steeped for half an hour or so in a lukewarm solution of permanganate of potash at a strength of about one-quarter ounce per gallon. This stains the cork a light brown color and the stock is then transferred to a cold bleaching bath containing 2 pints of bisulfite of soda 71-77° Tw. and one-eighth pint of D. O. V. 168° Tw. per 12 gallon bath. After steeping thirty minutes, the cork will be found to have turned a much lighter color than

the original shade. Bleaching can also be done by steeping the cork in cold sodium hypochlorite solution of 2° Tw. for several hours, or with boiling hydrosulfite of soda.

After the cork has been bleached, it is dyed in a boiling bath of basic dyestuff, together with a little acetic acid. After a few minutes processing at the boil, the cork is taken out of the bath because prolonged treatment in the boiling liquor causes the material to swell and eventually split. The following basic dyes are suitable for coloring cork: Malachite Green, Acridine Yellow, Rhodamine, all brands; Bismark Brown, Methyl Violet BB, Victoria Blue, Methylene Green G.

Celluloid is occasionally colored by the toy maker, the material being steeped for a few minutes in the warm solution of the dyestuff. Celluloid is usually dyed, or rather stained, in sheet form and both acid and basic dyes can be employed for the work. The celluloid is commonly processed in a cold solution of the requisite dyestuff without any acid or other assistant in the bath. The following basic dyes are suitable for coloring celluloid: Malachite Green, Methylene Green and Blue, Methyl Violet, Safranine, Bismark Brown, Auramine and Magenta. Acid colors suitable for the work comprise: Orange II, Tartrazine, Croceine Scarlet, Roccelline L, Patent Blue A types, Sulfoncyanine Navy Blue and Naphtol Blue Black.

Toys made of wood and fiber chip, etc., are often colored in the finishing process. In some instances, however, the toy makers use ready dyed veneer and wood chip. Basic colors are often used in dyeing wooden toys, the articles either being dipped in the hot solution or else a strong solution is applied to the article with a brush. For especially bright hues, Eosine colors are sometimes used, these being applied in a hot bath containing a little acetic acid and alum. When coloring wooden toys in the made up condition by dipping, it is important to use only dyes which are well absorbed by the wood at a quick rate, because a lengthy contact with hot liquor causes swelling of the wood with risk of warping or splitting of the softer parts in the contrivance. For this reason, basic dyes are preferred over substantives for the work, and the temperature of the liquor in the dipping kettle should not exceed about 180° F.

Natural grasses, leaves, straw, raffia plait, artificial flowers, etc., are often dyed by the toy maker, who uses one or other of the foregoing for embellishing his product, which may be a miniature tree for a toy farm-yard outfit or a thatch roof and miniature jardinière for a doll's cottage, etc., or perhaps a straw plait or chip basket for a juvenile embroidery or sewing outfit.

Natural grasses, leaf sprays and so forth are steeped overnight in a 2 per cent solution of Katanol, then dyed at 160° to 180° F. with basic color and one-quarter pint acetic acid per 20 gallon bath. In order to prevent the leaves from turning brittle when dry, they are soaked for a short time in a solution of calcium or magnesium chloride of 20°-28° Tw., and afterwards allowed to dry naturally by hanging in a shady apartment. When dry, they should be quite pliable; if not, they are reprocessed with the chloride solution. Straw plait and raffia are usually dipped in a hot solution of appropriate basic dyestuff, if a bright color is demanded. Acid and substantive dyes are also suitable for coloring straw and raffia. Acid colors are applied at the boil with 5-10 per cent alum; substantive dyes are processed in a boiling bath with 5 per cent common salt. After a short boil, the material is allowed to feed in the cooling bath for a period.

The method and dyes used in coloring artificial flowers depends upon the materials from which the flowers are made. In most instances, the flowers are of too fragile a nature to permit of being steeped in hot solution of dyestuff. In this event, a solution of dyestuff is sprayed on the petals by means of a suitable apparatus. Wax coated flower petals are sprayed with an appropriate color base of the oil soluble type which has been dissolved in a suitable solvent. Flowers with cotton or silk velvet petals are sprayed with spirituous or aqueous solutions of basic dyestuff.

Plaster and papier mache composition bodies for dolls and toy animals are dyed by a short immersion in basic color solution. Plaster easily absorbs the dye, hence the solutions must not be strong or the shade might turn out patchy. Papier mache articles should not be processed in too hot a bath, or the substance will swell and warp. Acid and substantive dyes can also be used for processing papier mache articles, acid dyes being applied with alum, and substantive colors with Glauber or common salt. However, it is the more usual process to color this material by brushing or spraying methods.

Articles made of vegetable ivory like chess and checker men, dice slabs for the lower halves of dominoes, lockets, miniature charms and similar trinkets are colored at the boil with substantive dyes.

Clay pipes for bubble blowing and other non-glazed pottery toys are tinted by imersion in a hot solution of basic dyestuff. Miniature wax candles for Christmas tree decorations are colored by incorporating a suitable proportion of oil soluble dyestuff in the molten mixture of stearine and paraffin wax used in casting the candles. The wooden parts of toy violins, xylophones, harps, accordions, and other "musical" instruments are colored by immersion in a hot solution of basic dye. In some cases, the material is stained by brushing on a solution of basic dye in industrial alcohol, since this does not easily warp and roughen the wood as an aqueous solution does.

Toy animals and dolls made of starch, glue and plaster composition are colored before moulding in some instances. The hot solution of basic dyestuff is boiled up with the starch, then intimately mixed with the rest of the ingredients in a mill until the mass assumes a homogenous color. In some cases, pigment colors carried on china clay or some other cheap vehicle, are employed in coloring these moulding compositions.

Black and Navy

Union Dyestuffs

on Half Wool Piece Goods

By C. W. Nelson

ON the grounds of economy, it seems a frequent practice for many dyers to build up union dyestuffs for themselves, and it is for such that these few notes are intended.

BLACK UNION DYESTUFFS

The majority of cheap black union dyestuffs now available appear to consist of a substantive or direct cotton black dyestuff incorporated with a little red or reddish violet neutral acid dyestuff. The direct dyestuff comprises the basis of the color, and the acid shading dyestuff modifies the greenish tone, which would otherwise be produced. Simple mixtures of the foregoing type yield poor, thin blacks despite prolonged and vigorous boiling of the bath.

In order to overcome this tendency to greyness in the color of the wool, it is customary, in the better cases of union black dyestuffs, for the color maker to incorporate a quantity of neutral acid black into the mixture. Naphthalene blacks, either of the greenish blue "base" type, or otherwise shaded to dead black, are suitable for use in building up black union mixtures.

The richest and most full-bodied blacks obtainable by single bath methods are, in the writer's opinion, secured by the use of one of the sulfoncyanine blacks for shading the wool. Moreover, and this is an important point in many cases, the sulfoncyanine black appears to withstand cold water washing in the dolly better than the other neutral acid black enumerated. In both cases, the fastness to light is quite good.

Union black in which naphthalene black is the shading medium for the wool yields a rather thin toned black color, possessed of a greenish cast which is useful when matching the tone of "diamond" or "after-chrome" black.

On the other hand, where sulfoncyanine black is used for shading, the resulting tone of black compares with that produced by logwood in bloom and fullness, especially if care is taken not to boil the bath too long and vigorously. Such procedure has a dual effect, namely, (1) the substantive black dyestuff forced on the animal fiber flattens and dulls down the bluish overhand cast of sulfoncyanine black, and (2), the shade of sulfoncyanine black is depreciated by overmuch boiling and becomes dulled and leaden looking, like a common naphthalene black mixture. An addition of up to 1% bichromate on the weight of the wool to the dyebath is found to retard the degradation of Sulfoncyanine Black. There are two drawbacks to reckon with when considering this plan, firstly that decreased value from the cotton dyestuff is obtained and secondly, the practise of adding bichromate when standing baths are kept results in dirty dyeings which give trouble from rubbing.

In view of the poorer affinity of naphthalene blacks for the animal fiber, compared with a sulfoncyanine black, the employment of the standing bath is all important where economy in dyestuff has to be considered.

In order to get good results from a union black mixture, consisting of neutral acid and substantive dyes in combination, the quantities of the main components ought to be compounded to correspond with the percentages of each fiber in the goods. There are so many varieties of unions in use nowadays (without taking into consideration other than wool and cotton mixtures) that it is hardly feasible to expect a standard union black mixture to be of all round utility in coloring such a diversity of fabrics. Yet, some dyers appear to expect a union color to possess such desirable but impossible qualities, without stopping to consider the why and wherefore of things, making use of the one union dyestuff indiscriminately on all kinds of wool and cotton unions. Afterwards, they probably have cause to wonder why poor results are obtained.

When compounding a union black dyestuff for goods which are truly half wool, i.e., consisting of wool and cotton in equal amount or thereabouts, it is a safe rule to employ equal amounts of sulfoncyanine black and common direct black. This refers to dyestuffs of standard strengths. If the goods contain a good deal more wool than the foregoing example, for instance, twenty or thirty per cent more, than the quantity of sulfoncyanine black in the mixture may be increased accordingly, whereas the amount of cotton dyestuff should be correspondingly reduced. At the same time, care should be taken not to curtail the cotton dyestuff unduly, otherwise badly covered cotton will be the result. In cases of doubt, it is better to be generous with the cotton dyestuff and use a little more wool color for shading, after samples have been taken from the goods. It is sometimes the case that a common direct cotton black dyestuff is not sufficiently fast to light to be suitable for unions containing much surface cotton. In this case, one may use Cotton Black F. or G. This product possesses a marked superiority in its resistance to light, but it is much more expensive than the other colors.

NAVY UNION DYESTUFFS

Union navies are built up on similar lines to the foregoing black mixtures.

For coloring the cotton portion of the unions, the Direct Black B. H. type of subtantive dyestuff will serve, while Sulfoncyanine Navy Blue will do quite well for coloring the animal fiber. In building up a standard navy for half wool, proportions of about 2-2½ parts of Sulfoncyanine Navy Blue to 6 parts of Direct Black B. H. will be found useful. Very heavy navy shades frequently

require an addition of Direct Black E. to the B. H. black, in order to impart the intensity of color to the cotton. In navy shades compounded from the foregoing dyestuffs, it should be noted that the Sulfoncyanine Navy Blue plays a much greater part in coloring the wool than does the Direct Black B. H. The latter dyestuff has a very poor affinity for wool at any temperature when applied in neutral baths. As in the case of Sulfoncyanine Black, a little bichromate may be used in the bath, to ward off degradation of neutral acid color.

Direct Black B. H. is not anything like so fast to light as Sulfoncyanine Navy Blue, and if approximately equal fastness to the wool color is required, one may employ a fast navy cotton dyestuff, such as Sirius Blue B. R. R., with or without the addition of a proportion of Cotton Black F. or G. A little Sirius Violet R. or B. B. may be added to enliven the deep navy shade resulting from the combination of black and blue dyestuffs.

Shading dyestuffs of good fastness to light for the wool comprise: Coomassie Violet 2R. S., Supramine Bordeaux B., Supranil Brilliant Red B., Brilliant Indocyanine B. and Alizarine Cyanine Green. In addition to these fast colors, there is a host of acid violets, reds and greens, which are easily taken up by the wool in neutral baths. However, a great many of these are distinctly fugitive to light and are fit for nothing but the poorer classes of work.

● CARBIC RELEASES

The Carbic Color & Chemical Co., Inc., announces release of circulars on the following products. Copies of these circulars are available upon request.

Indigosol Blue I B C—said to produce bright shades of blue of excellent fastness properties, being, it is stated, superior in practically every respect to the older Indigosol blues. It is particularly recommended by the manufacturers for padding or dyeing plain shades on cotton or rayon where the highest degree of fastness is required. It is further stated that perfectly level results are obtained on both fibers. In printing it is said that clear shades of blue of superior fastness are obtained.

Indigosol Yellow V—said to give clear greenish shades of good all around fastness and that it should be of value as a self shade for the production of bright greens in combination with Indigosol Green I B A. This product is further said to be easily soluble and can be printed or padded according to any of the processes now in use.

● KENNEY-HERSTEIN, INC.

Karl M. Herstein, consulting chemist, announces that with Frederick Kenney, who has retired from the municipal service after fifteen years as chief chemist of the Central Testing Laboratory of the City of New York, has been formed the firm of Kenney-Herstein, Inc., which will be located at 18 East 41st Street and will engage in the field of consulting chemistry.

SULFUR BLEACHING

(Continued from page 420)

Fig. 8 depicts in diagram form an arrangement suitable for use when dealing with thick counts in worsted or mohair warp in an unbeamed condition. The warp threads pass in rope formation from the drum, D2, over a series

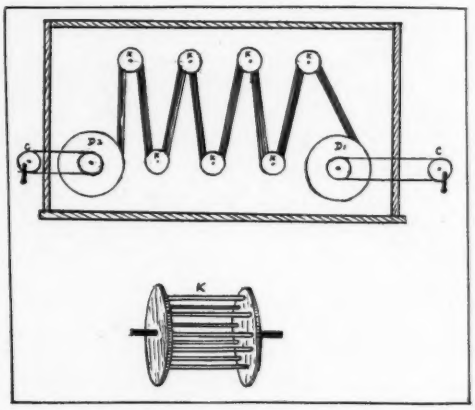

Fig. 8.

of smaller drums, K, and thence are wound upon another large drum, D1. Reference to the enlarged view of one of the drums, K, will show that it consists of a pair of discs united by a central shaft and a number of round-section rods. These drums are commonly made of hardwood. Referring now to the upper diagram, it will be noticed that the drums D1 and D2 are connected by driving bands with mechanism for rotating them, as indicated at C outside the bleach house. Warps in rope form are sometimes bleached without making use of the aforementioned apparatus; in this event, the warp is merely looped over a series of rods in the bleach house; since it remains stationary all the time it is in contact with the sulfur fumes, the central threads are not bleached so well as those on

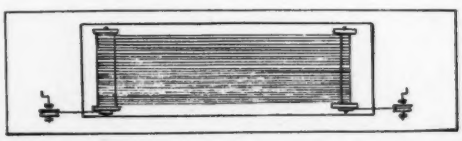

Fig. 9.

the outside of the bundle. A plan view of an arrangement for sulfur bleaching warp on the beam is depicted in Fig. 8, the warp strands being wound from one beam to the other during the bleaching operation.

● QUARTERLY PRICE LIST

The quarterly price list of the R & H Chemicals Dept., E. I. duPont deNemours & Co., Inc. for July, 1935, has recently been issued. Copies of this price list are available upon request.

Technical Notes from Foreign Sources

Indigoid Dyestuffs

German Patent No. 471,637 (*Feb.* 18, 1929)—*Kalle u. Co. A.-G.*—When sulfites are caused to react with alpha-isatine chloride, or its derivatives or homologues, the water-soluble derivatives of alpha-isatine formed will react, in aqueous solution, with phenols which contain a reactive hydrogen ortho to the hydroxyl group, to form indigoid dyestuffs. Appropriate phenols are the naphthols, oxy-thionaphthene, indoxyl, etc. A modification of the process proposes, in place of the reaction products between sulfites and alpha-isatine chlorides, the reaction-products of sulfites and dehydro-indigo, or its acid addition-products. An exception is made of such compounds, so obtained, as form indigo when treated with alkalies. One example is given.

Thio-indigo Dyestuffs

German Patent No. 477,062 (*May* 30, 1929).—*I. G. Farben-Ind. A.-G.*—Consists in the condensation of the mono - alkyl - mono - aralkyl, or mono - aryl ethers of 1-hydroxy-4-mercapto-naphthalenes or their derivatives, with components capable of condensation to an indigoid dyestuff. The two examples given describe products dyeing cotton a fast greenish-blue.

Vat Dyestuffs (Anthraquinone Series)

German Patent No. 477,284 (*May* 6, 1929).—*I. G. Farben-Ind. A.-G.*—In this patent, 1-amino-2-aldehydo-anthraquinone is condensed with halogenated anthraquinones, or their derivatives, in the presence of substances which will neutralize the halogen acid split out by the condensation, also in the presence of small amounts of a suitable catalyst, chiefly copper or its salts, etc. The products are in some cases afterward treated with acids or alkalies.

Two examples are given, describing the production and properties of a brown-yellow dyestuff, clear and strong in tone, and of a dark-bluish-violet, very fast.

Vat Dyestuffs (Perylene Series)

German Patent No. 470,160 (*Jan.* 7, 1929)—*Felice Bensa of Genoa, Italy.*—Consists in the reaction of halogenated methyl- or ethyl-perylene-diketones with metallic cyanides in the presence of organic media or solvents of the pyridine type, with or without pressure, by heat.

Diacetyl-dichlor-perylene or dipropionyl-dichlor-perylene, when treated with a metallic cyanide at a suitable elevated temperature in the presence of such a solvent as mentioned, pyridine, to facilitate the reaction between the metal of the cyanide and the reactive halogen of the perylene derivative, do not yield cyanides of the perylene series—at least, the reaction does not stop at that point, but, whether or not passing through that phase (most probable), proceed to the formation of more complex compounds, which are new vat dyestuffs. Three examples are given, describing the preparation of the diacetyl and the dipropionyl derivatives (mentioned above) by the Friedel-Crafts reaction, and the conversion of them into reddish-violet vat dyestuffs.

Vat Dyestuffs (Anthraquinone Series)

German Patent No. 470,501 (*Jan.* 18, 1929)—*I. G. Farben-Ind. A.-G.*—Reference is made to German Patent No. 453,768, which describes certain condensation products produced by reaction of anthrone or its derivatives with glyoxal. The present process covers the treatment of these products with alkaline condensating agents, in a general sense. The products of such condensations are no longer yellow to orange compounds, but red to violet vat dyestuffs of good fastness. Three examples describe the production of a bordeaux red, and of a bordeaux red of a more bluish tone.

Vat Dyestuffs (Pyranthrone Series)

German Patent No. 470,502 (*Jan.* 18, 1919)—*I. G. Farben-Ind. A.-G.*—Two processes are here described, for the reaction of bz-bz'-diaryl-pyranthrones with either oxidizing or purely condensing agents. The product seems to be the same substance, whichever method is used. If manganese dioxide is employed (as usual in sulfuric acid, the dyestuff is obtained directly). If the original material is treated with condensing agents, as, for example, anhydrous aluminium chloride, employed as usual, the final product is obtained, so to speak, in a preliminary reduced condition, which is easily converted to the dyestuff itself by oxidation. Two examples are given, the product dyeing cotton a bright orange, of good fastness, from a green hydrosulfite vat.

Azo Dyestuffs for Viscose

German Patent No. 474,301 (*April* 3, 1929)—*British Dyestuffs Corp., Ltd.*—The central point of this patent lies in the employment of 8-8'-dihydroxy-2-2'-dinaphthylamine 3-6-3'-disulfonic acid or 8-8'-dihydroxy-2-2'-dinaphthylamine-3'-6'-3'-tetrasulfonic acid, as second components in the synthesis of azo dyestuffs with any desired diazotized amine as the first component. The latter claim therefore covers the coupling in alkaline or in acid reaction, the last point also involving the use of mineral or organic acid. As the claim is so general, it is obvious that some amines may be used as first components, of such structure that by after-treatment before dyeing, (e.g., reduction of nitro-groups, or deacylation of acylamino groups) the dyestuff may contain free amino groups, and therefore, after dyeing, may be diazotized upon the fiber

and developed further. From the structure of the above-mentioned second components, it is plain that couplings would necessarily take place upon each naphthalene ring in reference to the hydroxyls, the products being therefore at least disazo dyestuffs.

Twelve examples are given. The special claim is made that the products produce level dyeings.

Azo Dyestuffs (Poly-azo)

German Patent No. 471,038 (*Feb.* 5, 1919)—*I. G. Farben-Ind. A.-G.*—A somewhat peculiar procedure is covered in this patent, consisting in diazotizing 5-nitro-anthranilic acid and coupling it to a suitable second component, then subjecting this azo dyestuff or pigment, as the case may be, to cautious reduction, by which each two molecules of the azo compound are linked together through the conversion of the two nitro-groups to an azoxy or even an azo group. In this reduction and linkage, a reduction of at least one of the two azo groups already established through the original amino groups would seem to be contemplated, and at least one amino group therefore regenerated, as the procedure goes on to describe the diazotization of the new product, either in substance or upon the fiber, and recoupled or developed with a desired new second component. The minimum number of azo groups in the final product is two, and may easily be more, according to circumstances; and the products, after location upon the fiber by direct application alone or with subsequent diazotizing and developing also, may be after-chromed or coppered, the dyeings then being naturally much faster to light and washing. Some of them are quite pure in tone, even after being after-treated, which is not usual.

Five samples are given—black, violet, blue, orange, brick-red.

Anti-Diazotates and Their Use in Dye Synthesis

H. T. Bucherer and E. Moehlau—J. Pr. Chem. 131, 193 (1931).—The ill-understood anti-diazotates, that is, diazo salts which have been stabilized, and certainly rearranged molecularly, by treatment with caustic alkali, have been the subject of much interest from the technical as well as from the theoretical side, for a good while. In consideration of the necessity of diazotizing an amine whenever developed dyeings, for example, are to be made, such a means of diazotizing large amounts of amines which are certain to be needed sooner or later, and of keeping them, safe from decomposition, for extended periods of time, in stock, against the time when needed, instead of having to go through the tedious and uncertain diazotization of p-nitraniline, for example, each time a dyeing is to be carried out,—in other words, being able to keep diazo-salts, made up in one large lot at one time, ready thereafter for immediate use—this brings the question down to a matter of actual dyehouse practice; the anti-diazotates must be considered as a group of very great value and importance in the most practical sense.

The authors review the whole subject of anti-diazotates. Some interesting points are brought to light. For example, in comparing the coupling of p-nitraniline diazotized and used as the chloride (i.e., as usually employed) or diazotized and converted to the stable sodium anti-diazotate, each form couples to the naphthols, naphthylamines, amino-naphthols, and the sulfonic acids of them all, with equal ease (in a general sense) and completeness, although with the diazotates the excess of caustic present must be controlled—the caustic reaction must be very slight, the active alkalinity must be that of carbonate; and, although the coupling is more deliberate, so to speak, yet it can be carried to completion in a reasonable time by working at temperatures up to 100° C.

As to the naphthylamines, coupling with the anti-diazotates is not so easy as with the naphthols—but this is equally true with the ordinary diazo-chlorides. Coupling to an amine as second component is, as a rule, always much more slow than when a phenol is the second component, although, of course, there are a few exceptions. At all events, in working with the amino-naphthols and their derivatives, the sulfonic acids, which are probably the most important of the whole naphthalene group, this slower coupling in reference to the amino group has the advantage that one can couple exclusively on the hydroxyl side of the naphthalene ring, thus avoiding the danger of an isomer of the dyesuff, of different color-tone, being formed, through coupling also taking place upon the amino-side of the ring. (In case such a coupling should be desired, one can at all events employ for that phase the older method, by using the diazo-chloride, and coupling in feebly acid reaction, which works well enough.) There is a striking difference in the attitude of J, gamma, and K acids toward the anti-diazotates. With J acid, the product will be an ortho-hydroxy-azo dyestuff, the other two give a mixture of the ortho and para couplings. This is not the case when diazo-chlorides are used.

To reduce the excessive caustic alkalinity of the sodium anti-diazotate solutions when ready for use, a condition which interferes with rapid coupling, the authors add such compounds as the chlorides of calcium, magnesium, or ammonium. With a sufficient amount of any of these, coupling will be rapid and complete at temperatures around 60°-90° C.

A few couplings are mentioned specially. With Nitrogene B (a condensation-product of 1-8-naphthylene-diamine-4-sulfonic acid and acetone) an insoluble azo black is produced. As to the normal chlorides of diazo-salts, that of p-nitraniline forms a diazo-oxide quantitatively with Tobias acid, and as this diazo-oxide is transformed quantitatively into para red, a means is thus afforded of rapid and exact determination of the percentage of Tobias acid present in a sample or mixture. The anti-diazotates of p-nitraniline behave in a similar way, but much more slowly.

Production of Hydrogen Peroxide by the Barium Process

By KENNETH L. CARR†

SPORT lovers get a particular thrill when a one-time champion, long inactive, succeeds in regaining his former standing. It is perhaps on this account that the recent successful entry of hydrogen peroxide produced by the classic barium process into the industrial bleaching field has attracted an unusual amount of interest in the trade.

The so-called barium process for producing hydrogen peroxide once had no competitor. That was in the days when peroxide was used almost solely as a pharmaceutical. Its use extended from medicine shelves to general antiseptics and no home was well equipped without this germicide.

As the use of this chemical as an industrial bleach developed and tonnage rose, the advantages which the classic process possessed in giving a product of exceptional quality could not overcome the handicaps of high cost and complexity of production method under which it then labored; which no doubt for a time diverted attention to simpler sounding schemes of hydrogen peroxide production. Electrolytic methods of production involving the cyclic formation and decomposition of persulfates, which had been originally developed in Europe soon became dominant in this field in this country as well.

For a period the barium process languished, but today a reversal of the tendency of the past few years is apparent. A rigorous chemical and engineering study of the process, coupled with the discovery of purer raw material sources and with the strategic location of production plants, has returned this scheme of manufacture of one of the most valuable of modern bleaches to its proper place in the industry.

By the use of modern equipment and materials of construction, by development of continuous methods of operation, and particularly through application of recently developed automatic control devices which reduce costs and hold process variations within narrow limits, the process has become completely standardized. As a result, costs have been reduced to a fraction of former levels without sacrificing any of the inherent advantages of quality, convenient concentration of product, and the decentralization of manufacture which the processes possess.

The modern development of the barium process begins with the discovery of barium ore reserves of unusual purity located immediately adjacent to the large by-product power developments of the great central irrigated district on the Pacific coast. Our barytes mines are located in California from which the basic raw material is obtained. This ore goes to the modern chemical operation

Fig. 1.

(Figure 1) located in the San Joaquin Valley, and supplied with power derived from the delivery of irrigation water of the fertile but dry ranches and vineyards which surround it. Here it meets coke from California's oil refineries, soda ash from its desert lakes, and has played on it the various tunes which our chemical engineers have learned. It ends its course in a blaze of glory, so to speak,

Fig. 2.

in our immense electric furnaces (Figure 2) each of which turns out in a day more barium peroxide than an old time plant produced in weeks.

Among the advantages we claim for barium peroxide are the following:

It is a stable, transportable, concentrated source of active oxygen, and, when pure, is readily convertible to hydrogen peroxide. It can be stored indefinitely without loss, and the final transformation made almost over night. To serve the West, it is converted to hydrogen peroxide in California. For use in the East, barium peroxide is shipped by water to Carteret, New Jersey, where the con-

†Chemical Engineer, Warner Chemical Co.

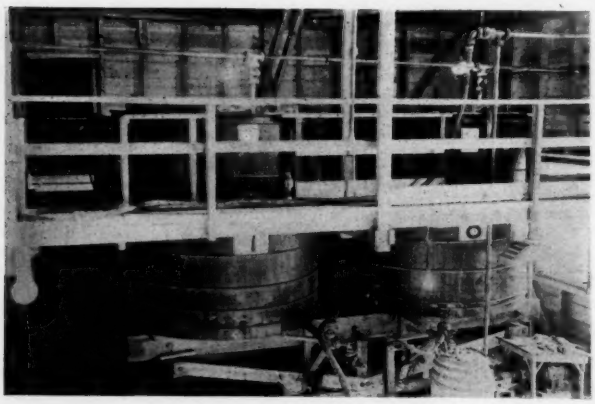

Fig. 3.

version plant (Figure 3) carries out the last step. Here, as throughout earlier steps of the process, exacting chemical control safeguards quality. And the logic of the revival of this process may be further apparent from the observation that phosphoric acid, the most important chemical required in the final step, is the base product of The Warner Chemical Company plant at Carteret where the Eastern hydrogen peroxide unit is located.

The revived process is strictly modern even as regards approach to distribution and handling problems. Although the barium process allows of production of hydrogen peroxide of the conventional 100 volume strength, examination of its economics showed that savings in cost to users could be had by so altering the final step as to turn out a material which could be transported by truck, pumped into storage tanks on customers' premises, and generally handled without the rather exacting precautions which the 100 volume material demands. Accordingly, the production of 25 volume hydrogen peroxide at Carteret, and its bulk transportation to users' plants, has become

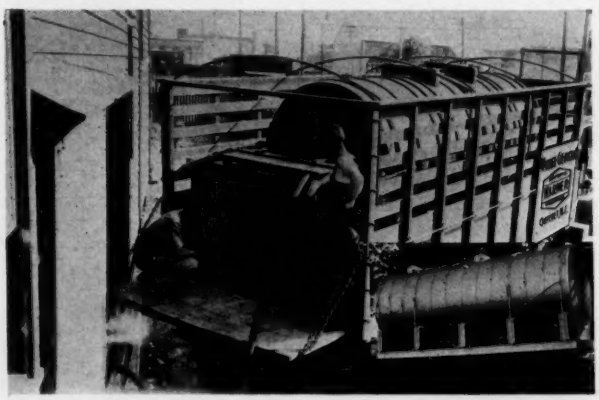

Fig. 4*.

standard practice. Figure 4 indicates the type of equipment employed. The simplicity and economy of this scheme, contrasted to carboy or drum delivery, is apparent. Carteret's location, in the heart of the northeast textile district, makes this preferred delivery service available to even the small consumer. At the same time the remarkable flexibility of the barium process, operating with a large reserve of stable intermediate product as a safeguard, allows of the widely fluctuating demands of the bleacheries being met without inconvenience or delay.

Illustrative of how well this method of delivery has been developed is the fact that for many years this peroxide has been delivered in this manner on the Pacific Coast under the most adverse conditions of wide temperature change. In some cases a tank truck load of peroxide has had to start in a temperature of about 100° F. only to end its trip a few hours later with the thermometer registering as low as 55° F.

All this, with a product which, by means of exhaustive research and exact control, is claimed by us to be positively second to none at this time—in uniformity, purity, and stability, accounts for the growing popularity of this peroxide.

And so the ex-champion returns, having fully recovered from the major operations which the experts have performed, full of renewed vigor and with a bag full of ultra-modern clubs.

*Note: Each truck is equipped with two motors, 1 A.C. and 1 D.C., and an interchangeable belt. Small photo in lower right hand corner illustrates the type of trailer used on the West Coast.

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

AVAILABLE—Supt., Boss Dyer, Executive. Long experience on silk or mixed fibers. Unusual knowledge of application and results of dyes and finishes. Past six years with Full Fashioned concern dyeing chiffon, service weights and resist work. American, speaks German and Spanish, would make connection with reliable concern in United States or elsewhere. Address Box No. 862, American Dyestuff Reporter, 440 4th Ave., New York, New York.

SALES EXECUTIVE—Not over 35 years old, must have experience in selling and demonstrating Sulfonated Oils, Sizes, Softeners, Textile Oils and Specialties for silk, wool, cotton and rayon, and comprehensive knowledge of consuming demand throughout the country. Must be capable of directing sales organization—one familiar with the actual manufacture preferred. Write giving full particulars, previous experience and salary expected. Unusual opportunity for right party. Address Box No. 863, American Dyestuff Reporter, 440 4th Ave., New York, New York.

TEXTILE CHEMIST & PURCHASING AGENT—Swiss Chemist, U. S. citizen, 36 years old, with European training and doctor's degree, possessing 12 years of experience in textile dyeing, desires employment as Chemist or Purchasing Agent. Can furnish best references and certificates. Address Box No. 864, American Dyestuff Reporter, 440 4th Avenue, New York, N. Y.